Plastic Products

May, 1933

VOLUME IX
NUMBER 3

In this Issue—

N. F. Peters
Perce Bowen
V. H. Dunham

PRIMER

Pertinent facts about a prominent factor in the plastics industry . . . General Plastics, Inc. . . . for the consideration of manufacturers with an eye open to Big Business.

Durez Oil Soluble Resins

LET the plastics-product manufacturer think about this: Durez Oil Soluble Resins offer advantages scarcely believed possible ten years ago!

Oil varnishes of the air-dry and baking types, paint vehicles, blending varnishes and pigmented goods made of this material have a finish that is durable, permanent, resistant to abrasion and acids. The luster is high, permanent, hard, possessing unusual adhesive properties.

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DUREZ

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- *Laminating Varnishes:* Phenolic varnishes for producing laminated sheet tube and rod stock—in various odorless, high dielectric, decorative, punch stock, water-resistant grades. Finished stock is widely used for insulating, structural and architectural applications.
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- *Molding Compounds:* Phenol-formaldehyde molding powders of the thermosetting type, formed in heated steel dies, available in black and all colors. Used for electrical parts, knobs, handles, novelties, bottle caps, jars, boxes.
- *Plywood and Veneer Resins:* Thermosetting phenolic resins, used in hot-press gluing of plywood and veneers, giving greater shear strength, complete moisture resistance, greater flexibility, and resistance to vermin and bacilli.
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The automotive industry has found many places where varnishes made with Durez Resins do a better job. Here we see a workman spraying a brake-drum.

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TO MODERN AUTOMOTIVE ACCESSORIES

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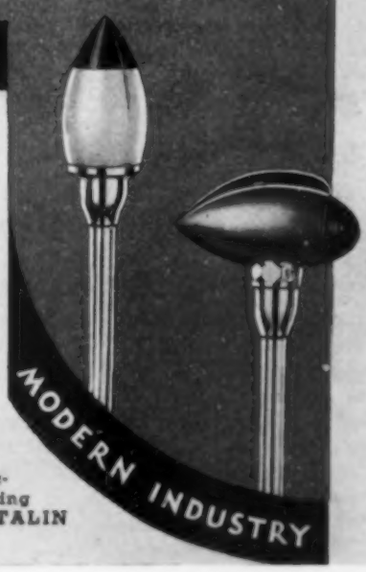
This is also a CASCO product... a cigar lighter for use at desk or table. Practical, indeed, and most pleasing to the eye—because of CATALIN



LUXURY—well directed. Yet withal an economy achievement! These CASCO fitments are but a few of many, wherein CATALIN has been adopted to beautify so practical an accessory as a shift lever—a cigar lighter—a horn button—a fender beacon. Today, manufacturers realize that their products require more than practical value to arouse sales value. To assure the latter they are making most of CATALIN value!

●

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230 PARK AVENUE, NEW YORK
BRANCH OFFICES IN PRINCIPAL CITIES

Plastic Products

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Volume IX Number 3

PLASTIC PRODUCTS is published monthly by Plastic Publications, Inc. Williams Haynes, *Chairman of the Board*; R. C. Gilmore, Jr., *President*; Robert C. Gilmore, *Vice-President*; Malcolm H. Frost, *Secretary*; William F. George, *Treasurer*. Published on the first day of each month at Pittsfield, Mass., and printed for the publishers by the Sun Printing Company. Entered as second class matter at the Post Office at Pittsfield, Mass., under the act of March 3, 1879. Subscription rates: Domestic, two dollars, in advance; Canadian, three dollars, fifty cents, and Foreign, three dollars a year; single copies current issue, twenty-five cents each, back issues, fifty cents each. Notice of three weeks is necessary to change subscriber's address. Kindly give both the old and new addresses. Editorial and Advertising offices, 25 Spruce Street, New York, N.Y.

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A

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Communications should be addressed to their Secretary

Molded Insulation Section

NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION

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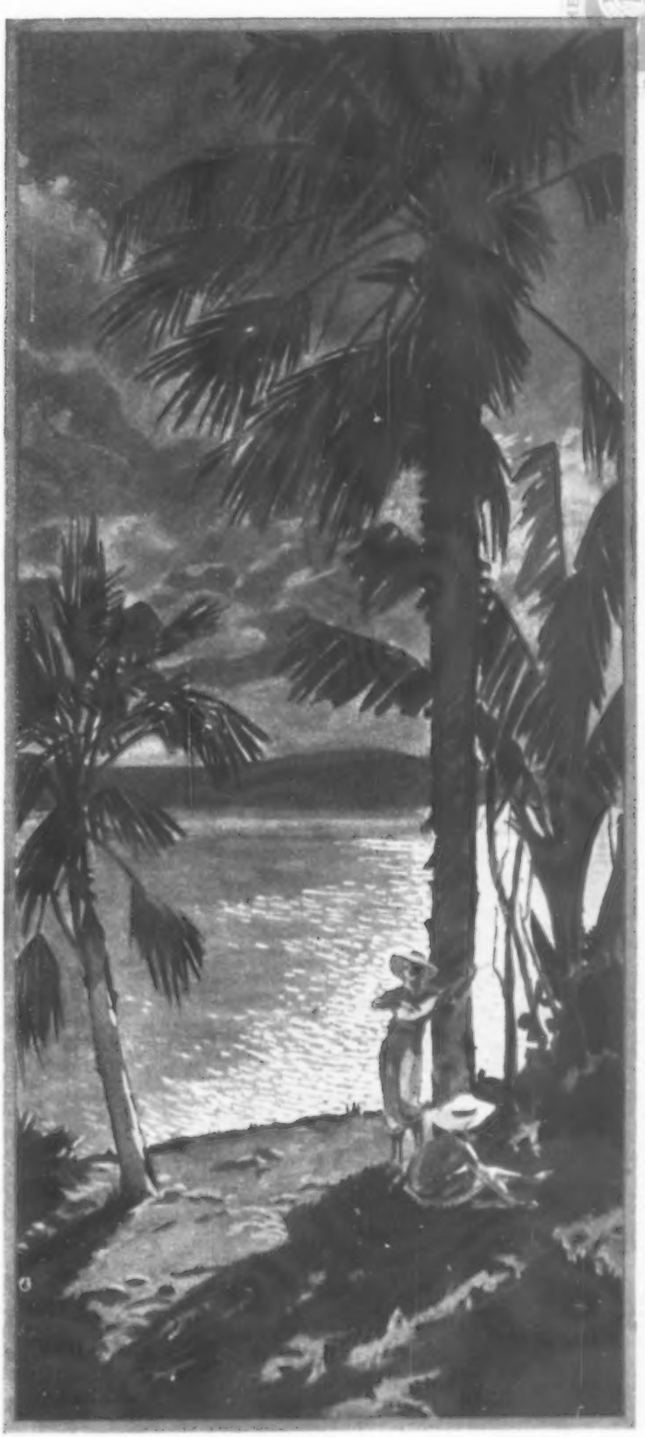
NEW YORK CITY

For Glowing Beauty



No other protective coating presents such wide adaptability as lacquer. Not only can it be "tailor-made" to fit practically every user's requirements, but it also lends itself ideally to the fine colors and shades which are the vogue of the day.

And because of its resistance to destructive influences, and because of the ease with which it may be cleaned, lacquer keeps its beauty for exceptionally long periods of time.

NOTHING CAN TAKE THE PLACE OF *Lacquer*

BUTANOL *Assures* **LACQUER QUALITY**

Nothing can take the place of Lacquer

Note these 12 Points of Superiority

1 **Lacquer dries rapidly—in minutes, not hours.** When production is at peak speed, lacquer easily keeps pace. When schedules are slowed down, lacquer permits quick finishing and shipping as orders are received—no finished stocks need be maintained.

2 **Lacquer dries hard—and then remains unaltered.** A lacquer finish does not check or craze on ageing. Heat or cold does not affect it.

3 **Lacquer is print-proof.** After the brief period required for drying, lacquered articles can be stacked, or crated for shipment without fear of printing. No matter how hot the day, lacquer will not soften or "print."

4 **Lacquer is stable in the drum or can, no matter how long it may be stored.** It does not form seeds or granules, nor does it skin-over.

5 **Lacquer produces a clean surface, free from nibs, grit, and dirt.** Because it is stable in the drum or can, and because it dries so quickly that dust or insects are prevented from lodging in the drying coating, lacquered surfaces are remarkably smooth.

6 **Lacquer does not water-spot.** It is very resistant to the action of water—it will not whiten.

7 **Lacquer cleans more easily.** No other coating can compare with it for ease of cleaning. Soaps and cleaning compounds may be used freely—they cannot harm lacquer.

8 **Lacquer is stain-proof.** It resists the action of alcohol, oil, gasoline, and all ordinary stains.

9 **Lacquer does not wrinkle—all coats unite into one solid, uniform film.** Each succeeding coat merges into the preceding, welding all into one uniform, smooth film.

10 **Lacquer "touches-up" easily and perfectly.** Spots, blemishes, and damaged areas are easily touched up; the recoated section blends so perfectly with the surrounding area that the repaired spot cannot be detected.

11 **Lacquer can be "tailor-made" to exactly meet the needs of practically every user of protective coatings.** No other finishing material has such a wide range of adaptability.

12 **Lacquer is long-lived—and retains its beauty.** Because of the resistance which lacquer offers to all destructive influences, its life is exceptionally long. And because of the ease with which it can be cleaned and polished, lacquer retains its beauty.

Because of the enduring satisfaction which it brings to the user of the coated product, lacquer is the outstanding goodwill builder amongst all finishing materials for both the maker and user of protective coatings. Nothing can take the place of lacquer.

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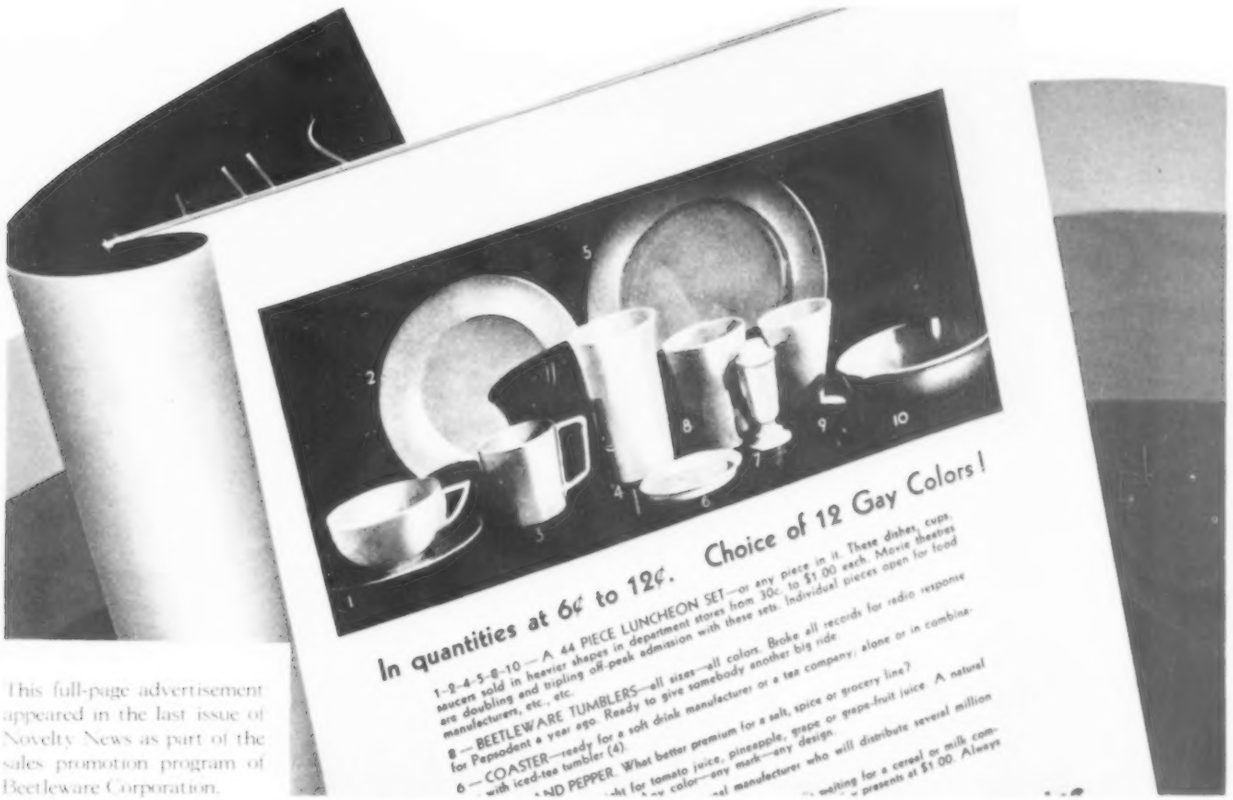
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...al manufacturer who will distribute several million ... waiting for a cereal or milk com... presents at $1.00. Always

This full-page advertisement appeared in the last issue of Novelty News as part of the sales promotion program of Beetleware Corporation.

AS IN 1932

this Season's Biggest Premium Deals

Feature Beetleware . . .

In national magazines, in newspapers over the radio, in store windows, new millions of American housewives are learning about Beetleware. Judging by previous sales successes with Beetleware premiums, **every fourth home** will soon have a Beetleware tumbler, bowl or other useful household item.

Beetleware Corporation with its own sales promotion efforts constantly endeavors to widen the market for trade molders by increasing the national acceptance for the colorful beauty of Beetleware moldings. As a result only a small part of Beetle powder is going into fields where price competition from phenolics is even a factor in the sale of a molding job.

Right now Beetleware full color advertising in the drug, cosmetic packaging and premium field is reinforcing the national advertising and national distribution gained by dozens of successful "merchandise deals." Molders of Beetle molding powder can realize on the value of the Beetleware name by obtaining consent in specific cases to mark premiums with the "Beetleware" trade-mark.

You'll close more business at better prices if you show samples and quote first in Beetleware and cash in on the confidence of the buyer by the use of this nationally accepted trade-mark!

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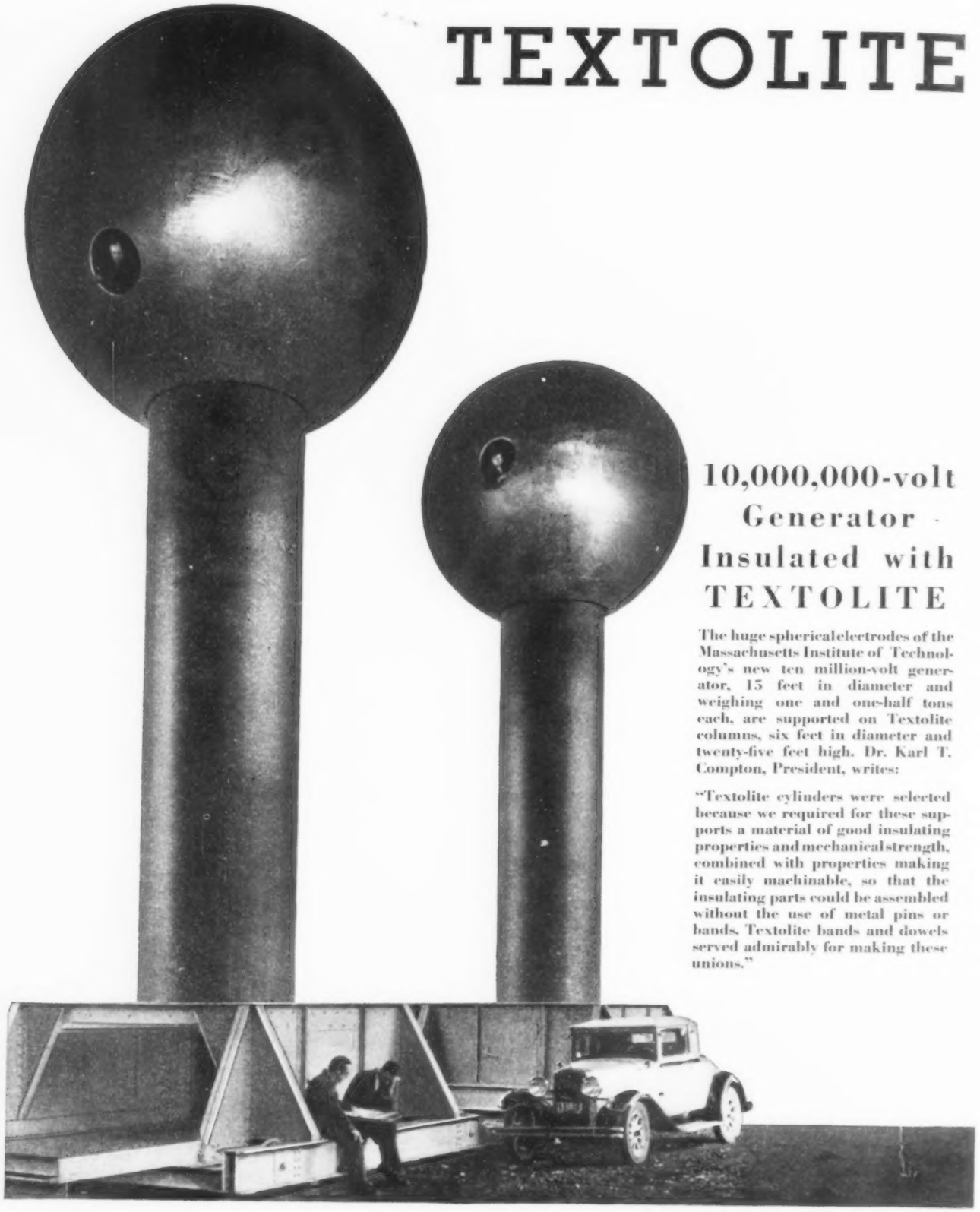
A Unit of American Cyanamid Company

CYANAMID PRODUCTS

535 Fifth Avenue, New York City

TEXTOLITE



10,000,000-volt Generator - Insulated with TEXTOLITE

The huge spherical electrodes of the Massachusetts Institute of Technology's new ten million-volt generator, 15 feet in diameter and weighing one and one-half tons each, are supported on Textolite columns, six feet in diameter and twenty-five feet high. Dr. Karl T. Compton, President, writes:

"Textolite cylinders were selected because we required for these supports a material of good insulating properties and mechanical strength, combined with properties making it easily machinable, so that the insulating parts could be assembled without the use of metal pins or bands. Textolite bands and dowels served admirably for making these unions."

GENERAL

A Plastic Material Molded by General Electric

LET US FIT IT TO YOUR PRODUCT

We can change its properties to fit your needs

ELECTRICAL parts that must meet exacting requirements; rich, lustrous, inexpensive cases for clocks and instruments; noncorrodible discs for pump valves; wear-resisting tires for casters; seat covers and desk tops—these, and hundreds of other Textolite parts, have been molded by General Electric technicians to help manufacturers create new products or to give new selling features to old products.

Simply outline your problem and, if possible, send us a sample or blueprint. The coupon is for your convenience.

Primary Properties of Textolite

1. High ratio of strength to weight
2. Resilience
3. Resistance to corrosion
4. Electrical insulation
5. Variety of forms
6. Lightness
7. Does not score or adhere to metals
8. Uniformity of structure
9. Easily fabricated
10. Permanency of properties
11. Low heat conductivity
12. Decorative

PLASTICS DEPT., GENERAL ELECTRIC COMPANY, RIVER WORKS, WEST LYNN, MASS.

Gentlemen:

We enclose a ☐ blueprint, ☐ sample of a part (check which). Please have your engineers study the possibilities of making this of Textolite. This request will be confidential and will entail no obligation on our part. Operating conditions to which part is subjected:

Electrical ..... Mechanical .....

Temperature ..... Chemicals .....

Is part for decoration only? ..... Color .....

What condition, if any, do you hope that Textolite will overcome? .....

.....

Name ..... *Company* ..... *Street* .....

City ..... *State* .....

ELECTRIC

Joseph Sinel says...

"Give the artist designer an opportunity to exercise his faculties in the best way known to him, then these designed products will have better sales response."

MR. SINEL also states "The mechanization of industry demands rational forms to meet machine processes. Old forms are too expensive to reproduce. Manufacturers who realize this use the services of artist designers to good advantage."

When called upon to design the products of industry one of the first interests of the designer is the types of materials to be used. Of these one of the most favored is Bakelite Molded. Line, form, color, surface, texture,—all these are greatly aided by the use of this material. Texture and surface forms are important to the hand as well as the eye. The pleasant feel of Bakelite Molded is one of its chief values.

Many instances may be cited where redesign and the use of Bakelite Materials have brought about a notable increase in sales. Whatever your particular product may be, it is probable that the use of one of the several Bakelite Materials would improve quality, appearance or performance, and correspondingly benefit sales. We would be glad to have you consult us at any time, and also send for illustrated Booklet 22M,"Bakelite Molded."

BAKELITE CORPORATION, 247 Park Avenue, New York . . . 43 East Ohio Street, Chicago
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario

Joseph Sinel, 48 Washington Mews, New York, N. Y. has earned a wide reputation for effective product design. One of the first artists to enter this field, he has a long list of successes to his credit. These include the "Acousticons" shown on this page, and widely varied products as gasoline pumps, cameras, truck bodies and scales.

BAKELITE

"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation, under the control of" the number of present and future uses of Bakelite Corporation's products"

THE MATERIAL OF A THOUSAND USES

Plastic Products

VOLUME IX NUMBER 3

"Plastic Patents"

QUITE an epidemic of patent litigation has broken out in plastic fields this spring. This is but natural. It is another sign of the growth of the plastics industry. But it is a costly ailment and it often gives rise to serious complications, and like the aftermath of measles and scarlet-fever, it may have damaging after effects.

"The state of the art," to borrow a convenient phrase from the patent attorneys, in the whole field of the manufacture, the formulation, and the use of plastic products is growing fast. In every country new plastic patents are accumulating at a rate that is the despair of those of us who must keep up with the literature. New synthetic raw materials, new ways and means of compounding, new applications crowd upon us. Important developments that make old materials and old methods obsolete almost overnight and yet simultaneously create great, fresh opportunities, are so common that they create a nervous tension which is a very great stimulus to research, but which reacts badly upon competition. This internal stress, added to the strain of the times, is unfavorable to healthy, natural expansion.

Based on the recent and familiar example of other new industries—radio and refrigeration are both splendid object lessons—patents can either help or hinder the development of the entire industry. Interferences and suits will often tie up progress and in the end prove but an empty victory for the successful contestant. On the other hand, licensing or pooling patents opens the door to activity while at the same time holding down the competition to a reasonable number of substantial and dependable firms. This is a good time to compromise rather than contest patent rights.

Furan Compounds

Dr. N. F. Peters discusses their use in

Coating Formulas

FURFURAL (Furfurol, 2-Furfuraldehyde, Furol, Furanaldehyde) is an aldehyde with properties resembling formaldehyde on the one hand and benzaldehyde on the other. Furfural undergoes many of the same type of chemical reactions that characterize the two aldehydes just mentioned, and in addition possesses solvent properties peculiar to itself alone which make it of interest to lacquer manufacturers, as well as to those interested in the selective solvent purification of organic crudes, such as wood rosin, anthracene, etc.

It was discovered about 1830 by Dobereiner and was named by Fownes in 1845 from the Latin words Furfur=bran; oleum=oil. Since that time it has been prepared from numerous sources, among which may be mentioned straw, flax, wood, cornstalks, bagasse, oat hulls, rice hulls, etc.

The only manufacturer of furfural in this country, and by far the largest in the world, is The Quaker Oats Company, who obtain it from oat hulls. The hulls are charged into a rotating autoclave with a few per cent. of sulfuric acid and are then subjected to steam at 60 lbs. pressure for a period of three to five hours. During the latter part of this digestion, steam is passed through the autoclave and into a continuous still, which is designed to deliver Furfural with a purity of 95%. The product is then passed through a drier to remove water and the material thus obtained is sold as technical Furfural and has a purity of 98.5-99.0% Furfuraldehyde. Vacuum distillation of the technical product produces a dryer and lighter colored material which is marketed as Refined Furfural. The two grades are sold under the following specifications:

	Technical	*Refined*
Boiling point	158-162° C.	158-162° C.
Specific gravity, 20° C.	1.158-1.160	1.159-1.161
Flash point	55-57° C.	55-57° C.
Acid (as acetic)	0.2% (max.)	0.1% (max.)
Weight per gallon	9.7 lbs.	9.7 lbs.
Shipping containers	1 and 5 gals. 500 lb. drums	9 and 45 lbs. tank cars

In carload quantities the freight classification is fifth class and in most of the eastern territory of the United States l.c.l. lots go as third class.

Technical Furfural, as it is sold on the market, leaves but a very small residue upon evaporation. A series of experiments carried out by evaporating 10-12 grams of Furfural in aluminum dishes in a vacuum oven at 100° C. showed an average residue of from 0.03 to 0.06%. Refined Furfural has an even smaller amount of residue.

A number of investigations have been made in regard to any toxic effects that might arise through the use of Furfural. While the odor may become somewhat objectionable if work with Furfural is carried out in a closed room, no toxic effects have been observed. Probably inhalation of it produces less physiological disturbances than would result from an equal exposure to many other solvents which are used at present.

Gardner[1] reports the solvent action of Furfural for cellulose nitrate and acetate to be as great as that of amyl, ethyl or butyl acetates, although it is somewhat slower in its action, requiring more stirring and a longer period for the full solvent effect to be exerted. As high as 40 ounces per gallon of low viscosity nitrocellulose can be obtained in solution in Furfural. Because of its high boiling point it prevents blushing. Colored, pigmented lacquer coatings made with as high as 50% of Furfural in the liquid portion (balance lighter solvents) can be cross-brushed ten minutes after application. Full drying occurs in about 30 minutes but the full degree of hardness is not obtained for 24 hours.

Because of this excellent solvent power in the early days of its commercial production Furfural was used by a number of lacquer manufacturers. However, owing to its very dark color and rather high acid content at that time, its use was almost abandoned. Recently, because of improved quality, renewed interest in the use of the product has been shown.

As indicated before, the color of Furfural is not entirely satisfactory from the lacquer manufacturers' point of view, but there is so little pigmenting power in even very dark colored Furfural that the use of this solvent is satisfactory from a color standpoint except where extremely light-colored or clear coatings are desired. Light blue, pale pink and lavender colored lacquers have been made with Furfural, and such products have been practically as stable toward light as similar products made with other solvents. However, as long as even moderately satisfactory water-white solvents are available, a manufacturer may hesitate to use Furfural, except for special purposes, even though practical tests may show the color change of pure Furfural to be harmless as far as the quality of his products is concerned. There is little doubt that were Furfural a water-white compound its use in pyroxylin products would be very much greater than it is today.

It might be mentioned at this point that the addition of 0.06-0.25% of hydroquinone or paraldehyde to freshly vacuum-distilled Furfural inhibits, but does not prevent a darkening of color. It has not been determined whether these inhibitors exert any beneficial effect insofar as the color of the lacquer coatings is concerned.

A considerable number of patents have been issued claiming the use of Furfural and its derivatives in connection with the use of cellulose esters and ethers. Carroll[2] uses a mixture of Furfural and a lower monohydroxy aliphatic alcohol to dissolve alkyl ethers of cellulose. In admixture with methyl alcohol[3], ether or benzol[4], Furfural is a solvent for nitrocellulose. Alone it has been used to prepare solutions of both nitrocellulose[5,6], and cellulose acetate[7], and with creosote[8] it is claimed to be a superior solvent for acetyl cellulose. A condensation product of a sulfonated phenol and aldehyde when dissolved in Furfural is claimed to make an excellent varnish[32]. The same solvent is used with phenol-aldehyde resins to produce varnishes[33].

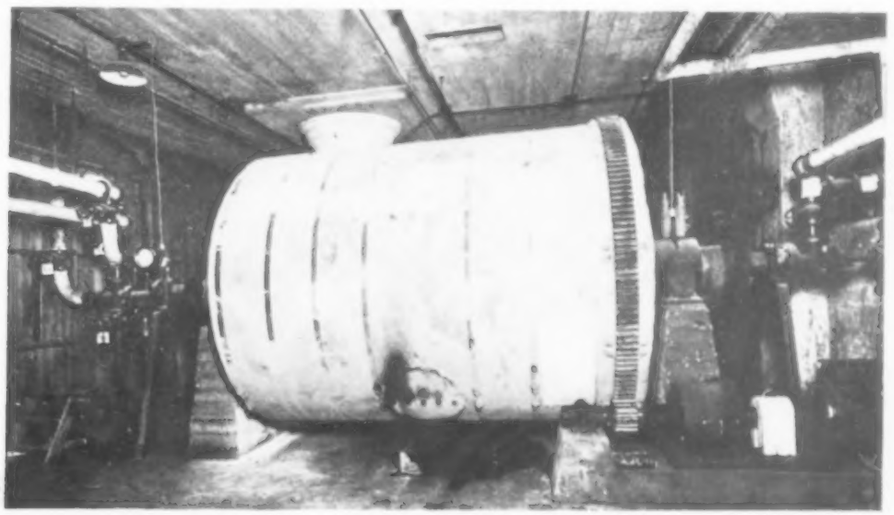
The majority of Furfural derivatives are solvents for pyroxylin and among these the hydrogenated products have received the most attention. The Quaker Oats Company owns patents on the use of Tetrahydrofurfuryl Alcohol[9] and Tetrahydrofurfuryl Acetate[10] as solvents for nitrocellulose. A number of satisfactory coating materials have been made using various furfural derivatives with the following formula:

½ second Cellulose nitrate	10
Ester gum	8
Dibutyl phthalate	7
Furfural compound(a)	6
Butyl acetate	27
Butyl alcohol	16
Ethyl alcohol	4
Toluene	22

(a) Tetrahydrofurfuryl alcohol
Tetrahydrofurfuryl acetate, propionate, butyrate and benzoate
Furfuryl alcohol
Methyl, ethyl, propyl, butyl and amyl furoates
Furfuryl acetate.

Tetrahydrofurfuryl alcohol as a solvent for pyroxylin[11,12] and polymerized vinyl acetate resins[13] has been claimed by Du Pont in a series of American and British patents. Furfuryl Alcohol is also an excellent solvent for cellulose esters[14].

While Furfural is produced in larger quantities than any Furan derivative at the present time, nevertheless such products as Furfuryl and Tetrahydrofurfuryl Alcohols, Furoic Acid and the Furoic Acid Esters are, or can be, made available in commercial quantities should a demand arise for them. In fact, during the present year Butyl Furoate has become available in commercial quantities. The price is quite high which seriously militates against its use in the solvent field. However, it is probable that the prices of these compounds will become lower, in which case they certainly will become of interest to lacquer manufacturers. Even at the present time small quantities of them are being used by a number of



A rotary digester in position to discharge oat hull residue. The charges are introduced through the opening shown in floor above.

plants including some of the largest in the field. These specialized uses include the preparation of striping lacquers, varnishes for metal cans, etc. It is for this reason that the following tables are presented, showing some of the physical and chemical properties of the more common Furan compounds which may be of interest to lacquer manufacturers:

TABLE I
Physical Properties

Product	*Boiling Point Deg. C.*	*Refract. Index nD*	*Sp. Gr. 20/4*
Furfural	158–162	1.5260	1.1598
Furfuryl alcohol	165–172	1.4864	1.1351
Tetrahydrofurfuryl alcohol	172–180	1.4508	1.0514
Methyl furoate	177–184	1.4869	1.1786
Ethyl furoate	188–210	1.4782	1.1774
Propyl furoate	200–215	1.4750	1.0745
Butyl furoate	225–240	1.4740	1.0555
Isoamyl furoate	225–240	1.4720	1.0335

TABLE II
Solubility of Gums and Resins

Product	*Congo*	*Gaiiac*	*Dammar*	*Caumarone*	*Ester*	*Sandarac*	*Mastic*	*Kauri*	*Pontianac*	*Shellac*
Furfural	sw	ss	ss	s	s	ss	ss	ss	sw	ss
Furfuryl alcohol	sw	ss	sw	s	s	s	s	s	s	s
Tetrahydrofurfuryl alcohol	ss	s	sw	s	s	s	s	s	s	s
Methyl furoate	sw	ss	ss	s	s	sw	sw	sw	sw	ss
Ethyl furoate	sw	s	sw	s	s	sw	sw	sw	sw	ss
Propyl furoate	sw	ss	sw	s	s	sw	sw	sw	sw	ss
Butyl furoate	sw	ss	sw	s	s	sw	sw	ss	s	ss
Amyl furoate	sw	ss	sw	s	s	sw	sw	ss	ss	ss

s—soluble
ss—slightly soluble
sw—swells

TABLE III
Dilution Ratio

Product	*Toluene*	*Gasoline*	*Water*	*Butyl Alcohol*
Furfural	2.9	0.15a	0.07	2.10
Furfuryl alcohol	2.65	0.05a	0.08	5.0
Tetrahydrofurfuryl alcohol	7.8	0.55a	0.23	12.5
Methyl furoate	3.1	0.40		2.6
Ethyl furoate	3.45	0.65		6.15
Propyl furoate	3.9	1.05		12.5
Butyl furoate	3.8	1.35		12.5
Isoamyl furoate	3.2	1.60		12.5

a—forms two layers.

All of the tables are self-explanatory with the possible exception of No. 3, which shows the dilution ratios. These were determined by the method described by Davidson[15].

TABLE IV
Relative Viscosities of Nitrocellulose Solutions
(Temperature, 25° C.)

Solvent	*Time of Flow*	
Small-orifice Pipette	*Minutes*	*Seconds*
Furfural	6	1.7
Methyl furoate	13	38.4
Butyl acetate	1	3.3
Large-orifice Pipette		
Furfural		25.9
Methyl furoate		53.6
Propyl furoate		64.2
n-Butyl furoate		80.8
Isoamyl furoate		79.7

TABLE V
Mutual Solubility of Furfural and Water

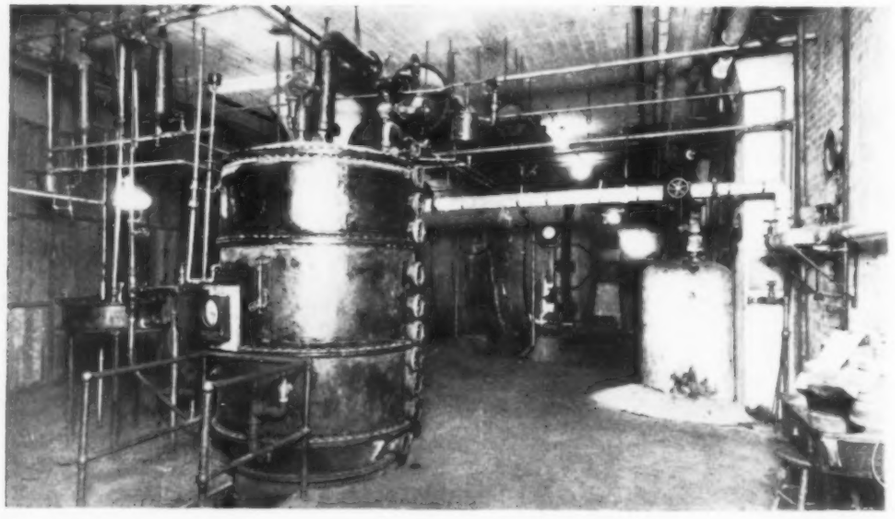
Temp.	*% Furfural by Weight*	
Deg. C.	*Water Layer*	*Furfural Layer*
10	7.9	96.1
20	8.3	95.2
30	8.8	94.2
40	9.5	93.3
50	10.4	92.4
60	11.7	91.4
70	13.2	90.3
80	14.8	88.7
90	16.6	86.5
97.9	18.4	84.1

TABLE VI
Solubility of Toluene and Benzine (Pet. Naphtha) in Furan Compounds
10cc. of Furan Compound

	Toluene	*Benzine (Pet. Naphtha) 86–88°*
	cc.	*cc.*
Furfural	all	1.1
Furfuryl alcohol	all	0.7
Tetrahydrofurfuryl alcohol	all	5.1
Methyl furoate	all	3.9
Isopropyl furoate	all	all
Butyl furoate	all	all
Amyl furoate	all	all

All = miscible in all proportions.

The data presented in these tables as well as the information given in the patents cited are sufficient to show the excellent solvent characteristics of most of the ordinary Furan compounds for cellulose esters



The top of a continuous furfural still. This gives a continuous stream of 98.5-99.0 per cent. furfural.

and ethers. As production of these products increases, refinement in technique will result not only in lighter colored products but also should enable them to be manufactured at lower cost, and these facts warrant the consideration of these products as commercial possibilities in the solvent and resin field.

TABLE VII
Table of Solubilities

Compound	*Amount*	*Furfural*	*Solubility*
Acetone	10 cc		all
Amyl acetate	10 cc	15 cc	S
Amyl alcohol	10 cc	15 cc	S
Benzol	10 cc		all
Brombenzol	10 cc	10 cc	S
Butyl acetate	10 cc	10 cc	S
Butyl alcohol	10 cc	10 cc	S
Isobutyl alcohol	10 cc	10 cc	S
Camphor gum	5 g.	5 cc	S
Cellulose acetate	3 g.	10 cc	S (gel)
Castor oil	10 cc	10 cc	S
Chinawood oil	10 cc	10 cc	S
Diethylene glycol monobutyl ether	10 cc	10 cc	S
Diethylene glycol monoethyl ether	10 cc	10 cc	S
Diethyl phthalate	10 cc	10 cc	S
Ethyl acetate	10 cc	10 cc	S
Ethylene glycol	10 cc	10 cc	S
Ethylene glycol monobutyl ether	10 cc	10 cc	S
Ethylene glycol monoethyl ether	10 cc	10 cc	S
Glycerol	10 cc	10 cc	I
Linseed oil	10 cc	10 cc	S (at 50 °C)
Nitrobenzene	10 cc	10 cc	S
Nitrotoluene	10 cc	10 cc	S
Paraldehyde	10 cc	10 cc	S
Turkey Red oil	10 cc	10 cc	S
Xylol	10 cc	10 cc	S

All—Completely miscible.
S—Soluble.
I—Insoluble.

TABLE VIII
Boiling Range of Methyl and Ethyl Furoates
(technical grade)

	Methyl furoate °C.	*Ethyl furoate* °C.
First drop	90.0	118.0
5% distilled at	177.0	188.0
10%	179.8	188.2
20%	180.0	191.0
30%	180.8	192.0
40%	180.8	192.7
50%	181.0	193.0
60%	181.0	194.0
70%	181.2	194.8
80%	181.2	197.0
90%	184.0	207.0
95%	188.0	210.0
Dry point	201.0	211.0

Varnish resin coatings using Furfural as a solvent in connection with cellulose derivatives have been patented[16]. The British Thompson-Houston Company[17] claims a coating composition made from a solution of a di- or polyhydric phenol dissolved in Furfural. This solution is spread on a surface which is then exposed to gaseous HCl to resinify it. A toughening agent such as cellulose acetate is said to add desirable qualities to this resin. This calls to mind the method of producing water-proof, acid-proof resins *in situ* by treating wood with furfuryl alcohol followed by a hydrochloric acid treatment. A beautiful black glossy finish is thus obtained when maple is used. Other woods give slightly different colors and the use of nitric acid enables unusual effects to be obtained.

The following lacquer is claimed to be suitable for application to metal surfaces[18]:

Resorcinol	11. parts
Furfural	19.6 "
Dicresyl Phosphate	6. "
Cellulose Acetate	1. "

The condensation products formed by the reaction of toluene sulfonamide with Furfural are claimed to be compatible with cellulose acetate and to form clear solutions that upon drying produce clear, hard, tough and firmly adherent films[19, 20, 34].

It is well known that Furfural condenses with amines, phenols and ketones and all three types of products have been proposed as protective coatings or as stains. Phillips and Mains[35] describe the preparation of Furfural-amine condensation products which in benzol or Furfural solution on white oak with a single coat give the following results:

Appearance of Furfural Varnish Stains on White Oak

	Shades Given by One Coat of Resin	
Resin	*Applied as Saturated Benzol Solution*	*Applied in Saturated Furfural Solution*
Furfural-aniline	Light Brown	Dark Brown
Furfural-naphthylamine	Dark Brown	Nearly Black
Furfural-o-toluidine	Medium Brown	Dark Brown
Furfural-xylidine	Dark Reddish Brown	Dark Reddish Brown
Furfural-acetone	Golden Brown	Dark Brown
Furfural-methyl-ethylketone	Golden Brown	Golden Brown
Furfuramide	Reddish Brown	Reddish Brown
Furfural-sodium hydroxide	Medium Brown	Dark Brown

Routala and Kuula[36] claim that Furfural-acetone gives a clear resin which is improved by substituting rosin for a portion of the acetone. Another patent[19a] describes varnish resins made by combining Furfural-acetone resins with cellulose ethers. Hydroxy-diphenyl-phenol resins are soluble in tung and castor oils and are suitable for covering leather fabrics[37]. Years ago it was reported that Furfural refluxed with lead or manganese oxides gave a substitute for drying oils[38]. This product produces a dry, non-tacky film on wood, metal, glass, etc.

Another novel coating composition has as a base a polymerized Furfuryl ethylene resin[25] dissolved in toluene and tricresyl phosphate together with a solution of nitrocellulose. The following example is illustrative of this product:

Furyl ethylene resin	10 parts by weight
Nitrocellulose (viscosity in 40% soln. in acetone = 30-60 c.g.s.)	30 " " "
Toluene	10 " " "
Butyl acetate	60 " " "
Ethyl acetate	45 " " "
Ethyl alcohol	5 " " "

It has been suggested by the research laboratories of The Quaker Oats Company that efficient plasticizers for pyroxylin coatings may be made from

Furan compounds. Among the products suggested are Furfuryl phthalate, glyceryl furoates and compounds of a similar nature; however the only products of this kind which have appeared in the literature are described by R. H. Van Schaack[21]. He describes the preparation of tetrahydrofurfuryl laurate, oleate, ricinoleate, linoleate, palmitate and stearate. No claim is made as to the use of any of these products.

The Hercules Powder Company states[39] that nitrocellulose films containing Furfural-phenol resins are less permeable to moisture than cellulose films containing almost any other resin.

Inasmuch as Furfural and its derivatives are such excellent solvents for cellulose esters, ethers, and for varnish gums, it is not surprising that investigators turned their attention to the development of paint and varnish removers comprising these products. Mains in two patents dedicated to public use claims the use of Furfural[22] and Furfuryl Alcohol[23] mixed with starch or wood flour as a paint and varnish remover. In a later patent Ellis[24] uses a mixture of Furfural, monochlorobenzene and a wax for the same purpose. Gardner[26] describes a paint and varnish remover made with Furfural containing 20% of solvent naphtha. The use of this solution leaves the surface free from wax. A series of recently issued patents give quantitative figures for the softening effect produced by Furfural and other paint removers[40].

Clement and Riviere[27] review the preparation and applications of various types of cellulose acetate and nitrocellulose lacquers and give a brief outline of a scheme of analysis of these varnishes. Coffignier[28] reviews the history of the development of the varnish industry and Deschiens[29,30] describes the use of Furfural in the manufacture of French airplane dopes.

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Can Insulation Properties Be Increased?

By W. H. Nuttall, F. I. C.

Distinction drawn between electrical conductors and insulators is generally arbitrary, because even the best insulating materials are conductors to a limited extent. In either case it is a passage of electrified particles through mass of the material.

Today, a large number of di-electrics, or insulators, are complex organic compounds, so that any ionizable matter they might contain must be regarded as impurities. A very obvious method of improving insulating materials would be by removal, as far as possible, of such ionic impurities.

At present, very little advancement had been made in that direction, except, possibly, in ebonite. Different methods adopted for improvement of electrical properties of ebonite were mainly based upon purification of rubber used. Protein matter was removed from latex by treatment with alkali and by washing. Breakdown value of such purified rubber was raised by some 300 to 400 per cent. By incorporation of up to about 10 per cent. of a highly absorbent carbon black, it was also possible to improve general electrical characteristics of ebonite by 50 per cent. Apparently function of carbon black was to absorb any moisture and electrolytic matter present. It was somewhat difficult to remove such ingredients from di-electrics generally. Small final conduction current was mainly due to electrolytic impurities.

Momentary large initial current, known as charging current might consist of two components. First of these was that known as a displacement of polarization current. All molecules were held together by electrical forces; therefore, when molecules were subjected to an external electric field they tended to become disturbed. Molecules were put in a state of strain by displacement of their bound electrons and protons in opposite directions. This displacement was known as polarization, hitherto neutral molecules becoming induced di-poles. If voltage increased sufficiently such displacement might become excessive, and eventually bring about breakdown.

With organic insulating materials breakdown by dissociation was not likely to occur, because they were usually composed of colloidal masses in which molecules existed in such a high degree of association that possibility of dissociation and ionization was reduced to a minimum. The second component of the charging current was that known as the absorption current. This was now generally supposed to owe its origin to the presence of permanent di-pole molecules in the di-electric. Permanent di-pole molecules were polar molecules possessing a definite hydrostatic moment. They did not tend to line up in the direction of the electric field. This orientation of the di-pole molecules was a very important factor in insulating materials, especially at high voltages, for two reasons. In the first place, electric energy was used up in causing the orientation. This di-electric loss might assume very serious dimensions, especially when dealing with alternating currents at high voltages. A di-electric loss was usually determined indirectly by the power factor which could be measured quite easily. Secondly, the energy dissipated by the turning of the molecules against the friction of the medium revealed itself in the form of heat, and unless the heat was dissipated much more quickly than it was produced the breakdown of the di-electric was assured.—*Abstracted from The Chemical Age.*

Plastics Abroad

By C. C. Concannon

Chief Chemical Division, U. S. Department of Commerce

THE plastics, synthetic resins and molded products industry has attained a commanding position in the world's industrial and economic life. Its phenomenal growth and the extensive application of its products has logically been attended by the establishment of representative trade associations or similar organizations in many of the producing countries.

Manufacturers of plastics and allied products in European countries appear to be especially active in forming associations for their mutual protection and benefit. In Great Britain, according to Trade Commissioner Roger R. Townsend, London, the plastics industry during recent years has been organized into two associations, the British Plastics Moulding Trade Association and The Institute of the Plastics Industry. The first is constituted under trade union rules and deals only with responsible officials of firms interested in the plastics industry. Those eligible to membership are proprietors of bona fide British firms established and manufacturing in Great Britain and Ireland, engaged in molding, manufacturing of molding powders, and materials supplied to molders; mold and molding plant manufacturing; casein, celluloid, cellulose acetate, synthetic resins, and allied material manufacturing. The association included in 1931 all of the molding powder manufacturers, 13 molding firms, seven mold makers and plant manufacturers, and three raw material firms. The second deals only with matters relating to the educational and social side of the industry. It is constituted under company laws as a private limited company, with the object of offering facilities to the plastics industry to meet; to arrange for the reading of papers, holding of lectures and discussions and publication thereof, on matters of interest to the industry; hold examinations and award diplomas.

The British plastics industry at present includes about 15 basic material manufacturers, about 100 consumer molders, and about 150 custom molders. The number of basic material manufacturers is steadily increasing, but there is no indication that this type of firm is extending its activities to include molding on their own account. At present the relative importance in the trade of the custom molder and the consumer molder seems to be nearly equally divided, with the balance probably in favor of the former, but with no very definite trend in either direction.

No general association in Germany covers the plastics and molded products industry as a whole, states Consul Sydney B. Redecker, Frankfort-on-the-Main, in a recent report. Such associations as have been formed cover specific commodities, such as buttons, rather than the basic material from which the finished articles are manufactured. Nevertheless, there are a number of trade organizations designed for divers purposes representing manufacturers of specific kinds of articles. However, these associations have decreased in importance in recent years. Many are so loosely organized they do not exert a strong influence on the general industry or even the particular branch they are designed to represent. Some operate for specific purposes, such as the establishment of technical standards, trade practices and maintenance of prices. One factor stated to have aggravated this condition is the prevailing economic depression which has seriously affected certain branches of the plastics industry, causing the failure of about 20 out of 50 German manufacturers of casein plastics. Some industries within the general plastics group have practically ceased to exist, this being true especially of the hair ornaments manufacturing industry, which was most seriously hit by the universal popularity of bobbed hair.

It is reported by Acting Commercial Attache Sam E. Woods, Prague, and Consul General Francis B. Stevens, that the Czechoslovak plastics and

molded products industry is divided into two major groups: (1) Basic material manufacturers, including producers of synthetic resins, casein plastics and pyroxylin plastics, and (2) custom molders who manufacture the finished product from the basic materials. Neither major group of the Czechoslovak plastics and molded products industry has an independent trade organization. The important firms engaged in this line of industry are members of the "Ustredni Svaz Ceskoslovenskych Prumyslniku" (Czechoslovak Manufacturers' Association), Prague, a national trade organization, established in 1918 for protection of Czechoslovak industries.

Czechoslovakian Plastic Organizations

The basic material manufacturers form one of the 25 sections into which the "Sdruzeni Ceskoslovenckych Prumyslu Chemickych" (Group of Czechoslovak Chemical Industries), a division of the Czechoslovak Manufacturers' Association, is subdivided. This section has 10 members among which are seven producers of synthetic resins, two producers of casein plastics and one producer of pyroxylin plastics. There are about 30 medium sized firms manufacturing pyroxylin plastics, but they are not organized.

The custom molders are not organized in the proper sense of the word. There are in Czechoslovakia several hundred firms engaged in this line, but the majority are small concerns employing less than 50 workmen. Manufacturers of buttons are members of the Button and Smokers' Products section of the last-mentioned association.

Both the groups of basic material manufacturers and the groups of custom molders form important links in the chain of Czechoslovak industries. In the latter group the manufacturers of buttons and cigar or cigarette holders are the most important, their products being exported to all parts of the world.

A small number of Czechoslovak producers of plastic articles are members of the "Gremium der Exporteure des politischen Bezirkes Gablonz a.N." (Exporters Union of the Political District Gablonz a.N.) The membership of this union is formed by approximately 500 firms located in and around Gablonz a.N. which produce the so-called "Gablonz goods" such as imitation jewelry, bangles, novelties, and small articles made of glass, plastics, etc.

The Czechoslovak manufacturers of casein plastics are represented by the "Omnia" Spol. pro vedeni a revisi prumyslovych organisaci sp. s.r.o. duverni spol. (Association for the Management and Audit of Industrial Organizations, Ltd.) in an international cartel of leading European casein plastic manufacturers.

The French output of plastics and molded products, reports Assistant Trade Commissioner E. C. Taylor, Paris, is made largely by the following types of firms classified according to type of base utilized: Phenol-formaldehyde—12; casein (galalith)-12; cellulose—8; ebonite—32; rubber—3; not specified—14. Some molding is done by the basic material manufacturers, but this phase of the industry is largely in the hands of numerous small custom molders.

Manufacturers of plastics in Italy, states a report from Trade Commissioner Elizabeth Humes, Rome, are members of Group IX (Plastics Industry) of the National Federation of Chemical and Allied Industries (Federazione Nazionale Fascista Industrie Chimiche ed Affini). There are 12 members in the group including one manufacturer of pyroxylin plastics, three manufacturers of phenol-formaldehyde resins, one manufacturer of cellophane, and six manufacturers of casein plastics, employing a total of 460 workers.

The object of the Federation is to protect and further in every way the interests of the industry, to publish a year-book, trade directory, and gather and disseminate statistical data, to prepare periodical reports on the industry, to represent the manufacturers in all questions relating to labor contacts and wages, to carry on research work and make reports on ways and means of modernization in production and distribution methods and reduction of production costs, to represent the interests of the members in all questions pertaining to tariffs, taxation, etc. and in all ways to promote the development of the industry.

It has not been possible to ascertain with any degree of exactness the number of custom molders or firms making manufactured articles from plastics. This branch of the industry is considerably older than the manufacture of the basic materials themselves and counts several hundred firms including manufacturers of buttons, combs, hairpins, brushes, toilet articles, purse and eyeglass frames, games, costume jewelry, smokers' articles, technical articles and numerous miscellaneous objects. These custom molders are incorporated for the most part in the Federation of Miscellaneous Industries (Federazione Nazionale Fascista Industrie Varie).

It has likewise not been possible to get any estimate of the number of consumer molders. These manufacturers belong to whatever trade association their particular branch of industry indicates, but in the majority of cases they are in the Mechanical and Metallurgical Federation (Federazione Nazionale Fascista Industrie Meccaniche e Metallurgiche).

It is evident from the above that there has been no attempt toward any concerted action in trade association work among the three branches of the plastics industry, i.e. manufacturers of plastics, custom molders and consumer molders, nor is such cooperation likely to occur under the present highly organized corporative system in Italy.

Additional information regarding plastics organization and foreign trade is available upon request to the Chemical Division.

Wood Flour
in Plastic Formulas

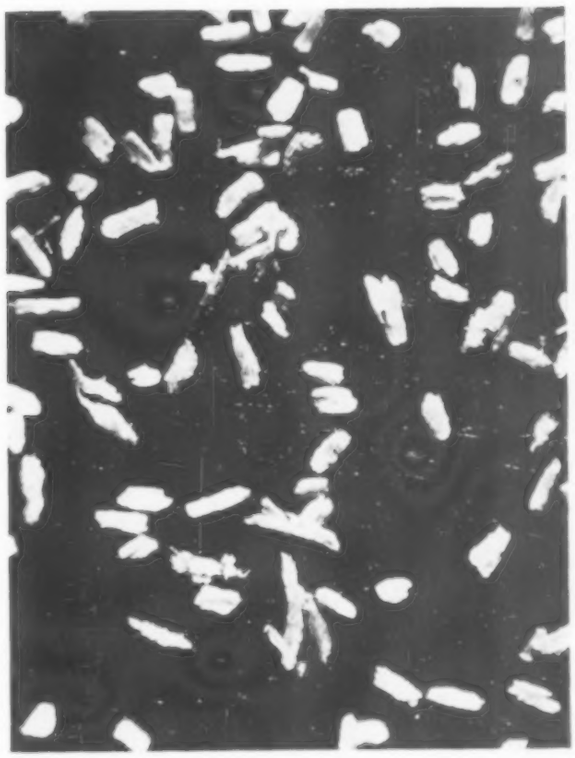
By Perce Bowen
Vice President, Becker, Moore & Co.

VERY little has been written on the subject of wood flour, possibly because it is simply a filler used in many compositions to give bulk and to help lower manufacturing costs. Some might say it is used to "cheapen" certain compositions, but this is not the right word. Wood flour is a very important ingredient and has its definite purpose in ninety per cent. of the uses in which it is incorporated.

Nowhere is there any better example of the really useful properties than in the plastic industry where most molding compositions use from 35 to 50 per cent. of this filler. The percentage used varies accordingly with the specifications of the finished molded piece. Delicate color shades and high lustre necessitate a lower percentage of wood flour. In molded articles where strength is more desired than looks a greater percentage of the filler is used.

American research in tracing the problems of increased strength and most perfect coverage along with the other requirements of the plastic trade, has developed many interesting phases. While it has been known for some years that white pine was the best of the common varieties of soft wood from which to make wood flour, it was learned that there are many different grades of commercial white pine. Trees grown in one section of the country were not nearly so desirable as pine from another section. It was then learned that the geographical conditions under which certain white pine was grown had very much to do with its ultimate use in the plastic industry. Considerable difference was discovered in the fibrous structure of the wood and the natural resinous contents in white pine from different localities.

Soft fibrous wood flour under microscope with resinous particles out.



Hard, grainy articles which are now separated.

For years wood flour has been sold on the screen analysis and the different grades have been so designated, for instance, 40 mesh, 60 mesh, 80 mesh and so on. This has been the basis for prices, the finer the mesh the more expensive the material.

Manufacturing costs in producing a very fine flour are more than those for coarse flour due to the additional pulverizing and more intricate screening apparatus; so far as the plastic industry is concerned, it is not screen analysis which governed its suitability, but the nature of the wood itself. It was found that some 80 and 100 mesh wood flour which is usually considered satisfactory for molding purposes, made from one grade of white pine, is not nearly so good as 40 mesh flour made from another grade. Numerous tests were made on very fine flour from 100 to 200 mesh, (which incidentally is very fine for wood flour due to its natural fibrous nature), and it was found that the strength tests, both impact and transverse, dropped off considerably. The finer the flour, the lower the strength tests. This is true of all the different grades of wood.

One of the most interesting discoveries of this experimental work was the elimination of the grainy particles which seemed to be the main source of trouble in all wood flour. After working for some months it was finally discovered that by instituting a new manufacturing process it was possible to remove the hard resinous particles from the flour, these resinous grains coming from the streaks of grain through the wood. With these removed it reduced the natural pitch content of the flour to a very low percentage and thus materially increased its affinity for the synthetic phenol-formaldehyde resins.

Another interesting part of this study was the lesson from various types of grinders and pulverizers used in reducing wood to flour. The type of grinder has much to do with producing the most desirable grade of flour. Numerous makes of grinders and disintegraters have been tried, some with rather sad results since wood flour will ignite and explode readily when confined under the wrong conditions. In producing wood flour for the plastic industry, successive grinding steps, through two different types of grinders, give the best results.

The moisture content of the wood previous to grinding will also vary the nature of the finished flour. For some grades it is necessary to increase the moisture content previous to grinding in order to produce the largest percentage of long thin fibres. This process increases the manufacturing costs, however, as it necessitates additional drying of the finished flour in order to comply with the specifications of the users.

The use of wood flour in the various molded plastic wares differs, of course, markedly, subject to the variations of the type and quantity, of resin, of color, of plasticizer, and the solvent employed in the formula. But taking as a general average result in the use of wood flour with phenolic resins, the following table may be taken as roughly representative:

Resin	*Wood Flour*	*Flex-Strength*	*Impact-Strength*
10 per cent.	80 per cent.	15,000 lbs. per sq. inch	.75
15 per cent.	75 per cent.	12,000 " " " "	.70
20 per cent.	70 per cent.	10,000 " " " "	.65
30 per cent.	60 per cent.	9,000 " " " "	.60
40 per cent.	45 per cent.	8,000 " " " "	.40

Obviously in physical appearance the larger the amount of wood flour included, the less smooth and brilliant the finish.

This whole subject of the specific use of wood flour with the various plastic materials has received careful attention from makers of these plastics and the variations for their own materials worked out in rather careful detail.

MEXICAN LACQUERS

by Ruth Le Lievre

MANY visitors to Mexico within recent years have taken home with them some piece of Mexican lacquer, a box, a tray, a chest, the result of an old and honored art which has seen a recent revival.

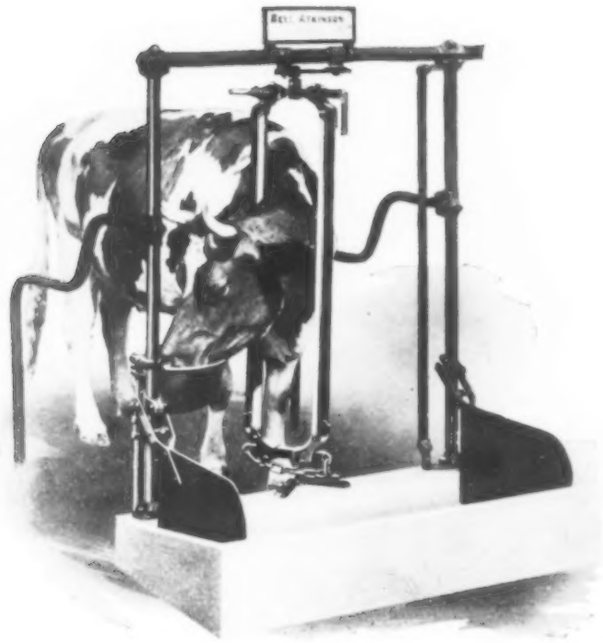
In that still savage state, Guerrero, a remote village with the magic name of Olinala is traditionally famous for its lacquer.

The Guerrero lacquer is done in two colors:—a basic color, and one in which the design is superimposed, giving a raised surface. Red is a popular color, combined with black, white, green or blue; but many others are seen, orange with green, black with white, etc. The dyes for the most part are vegetable, having as a base crushed cochineal. After the original coat is applied, the article is put aside to dry for a period of three weeks. This thorough drying guards against a tendency of the colors to merge. Once the first coat is perfectly dry, it is polished for an indefinite time (hours or days), the quality of the lacquer depending on the length of time spent in polishing. From the second coat of another color the design is cut away with the thumb nail or with a small implement resembling an orange wood stick, so that the original coat shows through. The slow drying quality of the lacquer permits the tracery of very intricate and delicate patterns of flowers, leaves and animals. With the pattern completed, the article is again put aside for the three weeks drying period, and again polished. A lustrous lace-like encrustation results. In the beginning only gourds and calabashes were lacquered. Today wood is used to form the boxes, trays and chests. Many of the small boxes are made from the scented wood of a native linolue tree.

Fine examples of lacquered gourds typical of Mexican handicraft from the private collection of Frances Flynn Paine.

The town of Uruapan, state of Michoacan, is the only other place in which lacquer has been produced in Mexico. Michoacan lacquer lacks the richness of the Guerrero. The design is cut out of the original coat, and then painted in with a variety of colors. To the naked eye the resulting surface is smooth; but the pattern is slightly raised, as may be perceived by running the fingers over it. Festoons of flowers, rural scenes, or animals in their natural colors appear on backgrounds of red, blue or black.

—Courtesy The Junior League Magazine.



Casein Plastics

by Dr. H. V. Dunham
Vice President, American Plastics Corp.

The casein plastic industry, at least so far as the United States is concerned, has not proved to be anything like as important a business as was expected and hoped for, judging by its development in Europe, and it is very doubtful if it ever will take a place as one of the leading plastics in this country. There are several reasons for this situation but probably the most serious one is due to the fact that a casein plastic will absorb moisture as well as give up its moisture with great ease. It, therefore, has the unfortunate property of expansion and contraction with the result that it cannot be used successfully in the manufacture of many articles for which it otherwise could be employed and for which it is successfully used in Europe. Combs, brushes, jewel boxes, wooden cased clocks veneered with casein plastic, fountain pens and the like are made and sold in great quantities in Europe, but in this country the climatic conditions are such that the combs will break very easily, the veneered clocks will crack and the boxes will warp out of shape. Therefore, casein plastics in this country are practically limited to the manufacture of buttons and buckles and in this industry one must compete with products made from the ivory nut which is an extremely cheap material.

Furthermore, in recent years the development of light colored synthetic resins, which may be beautifully colored in innumerable designs, supply the needed material for a variety of uses since such resins are little if at all affected by moisture or climatic conditions.

The first important work done on casein plastics was, we believe, carried out by Adolf Spitteler in Bavaria. There may have been some other patents developed previous to this date but Spitteler obtained a British Patent in 1899 and a similar German Patent in 1899 and he obtained one or more American patents a few years later. One of Spitteler's ideas, probably his first plan, was to dissolve casein with an alkali, for instance borax, in the presence of water and then precipitate the casein solution with some metallic salt, in one case with lead acetate, in another case if he wished a green colored finished product, with a nickel salt and so on, depending on what color he wished to obtain. After the precipitation the casein resulting was washed and pressed together and allowed to dry.

He also attempted to produce a transparent casein plastic by first dissolving the casein with an excess of caustic soda, enough of the alkali being used to partially break the casein into other modified types of protein and during the process throwing out the small amount of opaque material. The transparent, light brown casein solution resulting was precipitated by means of various acids or acid salts and he obtained quite a transparent product but one which lacked in strength.

In 1899 Hall applied for a patent for a casein plastic in the United States. His method was to dissolve the casein in an alkali, precipitate with various acid salts or acids, wash the casein, grind it very fine and put this ground mass into a form with a wire or cloth bottom and allow the fine particles of casein to felt together on practically the same principle as allowing paper pulp to felt together to make a sheet of paper. A company was formed to exploit this Hall patent, known as the Lactroid Company of New Jersey, but there were very many difficulties encountered, principally due to the surface cracking of the partially dried plastic so that it was utterly impossible to secure large sheets of the finished material.

It was after the Spitteler patents were taken over by people in Germany and a company formed that really commercial progress was made in the casein plastic industry and this was accomplished by using a hard rubber rod or tubing machine and making the casein plastic by the extruding process.

Many patents have been obtained in the various countries protecting certain features or special ideas regarding the making of casein plastics but most of them are relatively unimportant with the exception of the outstanding development of using an extruding machine for obtaining the plasticity and uniformity of the casein to form a plastic.

In 1908 a French patent was granted to Pozzi and Tondell for making a casein plastic. They proposed to treat skim milk with rennet to form curd. The whey was removed from the casein and then small quantities of sulfuric acid and hydrochloric acid added to this casein with a certain amount of water in order to bleach the casein. This acid solution was later removed and the casein washed with warm water. The wet casein was then placed in a jacketed kettle with a weak solution of lactic acid and gradually heated to about 40° C. The mixture was then allowed to remain thus for 15 to 18 hours when a reaction was supposed to have taken place which benefited the quality of the material.

To determine the desired consistency or quality of the resulting mass, a sample was removed from the kettle and put into boiling water and if the curing process or whatever it was supposed to be, had advanced far enough, the sample put into the boiling water would become a tough, rubbery mass. In that case the mixture

was then heated and stirred until the casein came together in a compact dough. The material was then transferred to a mixing machine, kept at a temperature of about 55° C. and worked until all the water in the casein was removed. The mass was then cooled, cut into small pieces, placed in molds and pressed for about 12 hours. The pressed sheets were then stained with any desirable color and placed in a pressure kettle containing glycerine and formaldehyde. The amounts of glycerine and formaldehyde used were varied, depending upon whether the finished product was to be more or less flexible and more or less waterproof. After this treatment the sheets were removed, dried and ready for use.

So far as we know this process was never practiced commercially to any great extent and from our knowledge of casein plastics today, we know that the cost would have been very high and the product very non-uniform and of poor quality.

Various methods have been suggested and patents have been obtained for mixing casein with celluloid, the idea being to obtain the most desirable qualities of both and eliminating the undesirable qualities of each. Such a material was formerly made in a limited way in Germany but it was never very successful. The product lacked the fireproof qualities of casein plastics and the extreme flexibility of celluloid.

Other attempts have been made in the way of modifying casein used in making casein plastics, such for example as allowing the casein to ripen or cure in the wet state for several days and then mixing it with kaolin, graphite, talc, gypsum, bone meal and the like, together with small amounts of oils and waxes, then molding the mixture in a warm condition, treating the molded material with magnesia, then soaking it in water and finally drying. So far as we know none of these products have been of much commercial value, the lack of uniformity and high cost of manufacture being largely responsible for their failure.

It has in times past been proposed to substitute hexamethylenetetramine for formaldehyde and the treatment of para-formaldehyde in such manner as to permit of its being added in solid form to the casein when the casein was molded, thus being able to do away with the long and expensive process of soaking the casein plastic in the formaldehyde bath. The addition of all sorts of resins, gums, higher alcohols, amino fatty acids and the like has been proposed.

A number of attempts have been made to produce a casein thermoplastic compound. Goldsmith secured several U. S. patents. He proposed to use certain quantities of substances like betanaphthol, resorcin, carbolic acid, hydro-chinone, pyrochatechin and similar types of material to produce this thermoplastic compound. The chemicals were either plasticized into the moist casein or they were dissolved in alcohol and poured on to the casein and the mixture dried and ground. The resulting product could be molded in dies under not excessive pressures or temperatures without the aid of any other plasticizing agent and without the presence of moisture and thus avoid any tendency toward warping of the finished material or shrinkage. While this process seemed to produce an interesting thermo-plastic casein compound, yet we believe that it was never a commercial success.

In several of the countries of Europe more or less casein plastics have been made by the tranchée method which is really nothing more than the compressing of fairly large blocks of the proper casein plastic into compact shape and then slicing these blocks by the same type of machine that is used in slicing celluloid blocks. By this method very thin sheets of casein plastics can be produced and at very much less expense than attempting to mold such thin sheets. The tranchée material is almost solely used in Europe for the manufacture of combs and there has never been a demand for this type of product in this country.

In the making of casein plastics there is no outstanding secret or method of any great importance, but there are literally thousands of minute details which are essential and are only obtained through years of experience in order to make this product successful. The type of casein used is of the utmost importance. Temperatures and pressures must be regulated in the most careful way and the long and tedious method of treating the material with formaldehyde in order to harden and toughen the casein plastic, requires very expert knowledge in order to make the product a success.

In regard to the mechanical properties of casein plastics. The following figures are fairly accurate and may be of interest:

CASEIN PLASTICS IN COMPRESSION

	Lbs. per sq. inch	*Kgs/sq. cm.*
Ultimate Compression Strength	27,800	1,960
Elastic limit	9,800	690
Modulus of elasticity	462,000	32,500

CASEIN PLASTICS UNDER TRANSVERSED LOADING

	Lbs. per sq. inch	*Kgs/sq. cm.*
Ultimate bending strength	14,900	1,050
Elastic limit	9,800	690
Modulus of elasticity	600,000	42,200

CASEIN PLASTICS HARDNESS

Binell No. 21
Shore-Scelerscope 61
Temperature effects upon Casein Plastics:

	Deg. F.	*Deg. C.*
First noticeable discoloration is at about	365°	185°
First blistering (material softening)	415°	213°
Badly blistered (soft and rubbery)	430°	221°
First smoke visible	540°	282°
Boiling action, (chars upon cooling)	600°	316°

One of the greatest difficulties in the manufacture of casein plastics is due to the fact that there is a tendency for the material to form minute cracks on the surface at any time from the point of extrusion to the finished dried material and if these small cracks once start, they seem to continue to develop and the finished product is valueless even though it may look to be a perfect specimen. These very minute cracks weaken the material to the point where it is of no commercial value so that it is necessary that the most careful control of the process from start to finish be exercised—otherwise a complete failure is the result.

It has also been found that if the conditions of manufacture in Europe are followed most minutely in this country, the resulting product is not satisfactory and here again the matter of climatic conditions enters largely into the matter in our opinion.

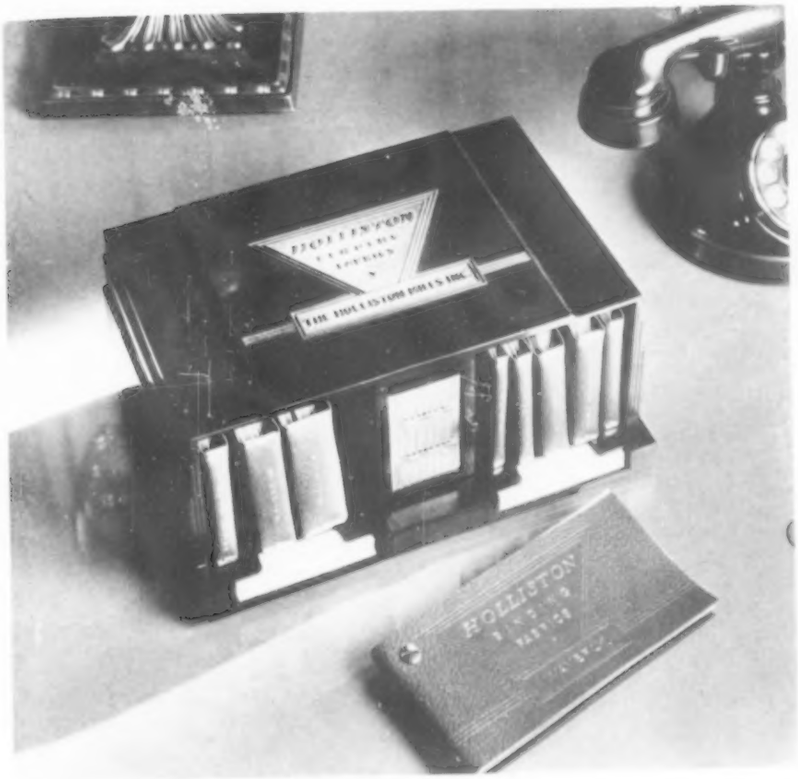
The present day method of making casein plastics would seem from a written description of the process to be very simple indeed, but the great care required, even from the starting point (fresh milk) to the final finished sheet or rod or tube ready to market can only be fully realized by those who have attempted to make commercial quantities. It is certainly very easy and simple to produce semi-commercial samples of casein plastics and this has been done by many experimenters who have honestly thought that it would be still more simple to produce the material in factory practice only to find later nothing but trouble, poor material and that excessive losses were the result.

Exports of Lokombitsika Wax from Madagascar

Year	*Destination*	*Quantity Kilos*	*Value Francs*
1923	France	49,870	49,870:00
	England	16	16:00
	Switzerland	4	4:00
	Total	49,890	49,890:00
1924	France	1,657	1,988:00
	Germany	5,040	6,048:00
	Total	6,697	8,036:00
1925	Germany	2,000	8,000:00
1930	France	145	580:00
1931	France	19,400	77,000:00

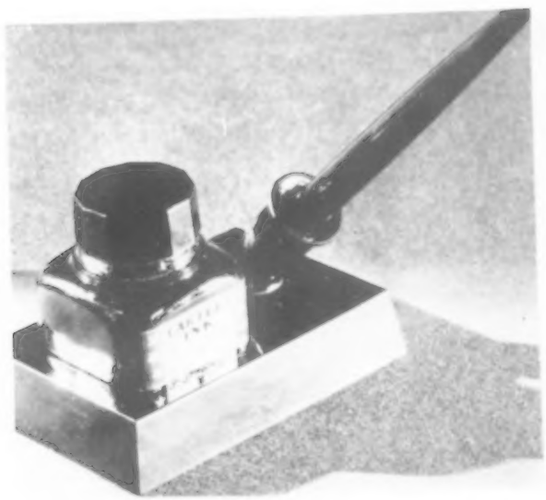
There were no exports during the years 1926 to 1929.

Plastics in Pictures



Of particular interest is this handsome black Bakelite Molded cabinet recently introduced by Holliston Mills, Inc., to display their wide variety of binding fabrics in the most convenient and attractive form. Aside from being attractive it is practical and compact.

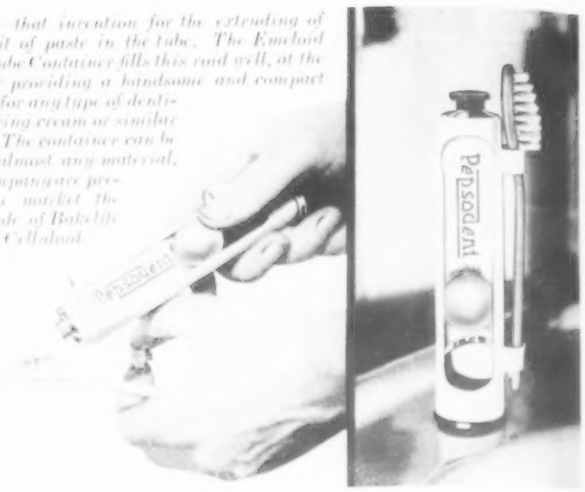
Designed primarily as an aid to better packaging, this molded base and funnel used for Carter's Ink is bound to become at once an innovation and prove decidedly popular with their customers. A small bottle of fountain pen ink fits into a small depression molded into the base, and a Duco cap completes the ensemble. Cap by Colt's, base molded by Northern Industrial Chemical Company.



Sir Harry McGowan, speaking at the Annual Trade Luncheon of the British Plastic Molding Trade Association, gives as his opinion that the industry is only in its infancy, and that opportunities for considerable expansion undoubtedly exist. He said: "So far as the only available statistics show, our foreign trade balance in these materials is still unfavorable, although it must be recognized that the domestic industry is by far the predominating consumer of these materials. Considering the extraordinary manner in which the plastics industry has already penetrated into other industries supplying domestic needs, it is difficult to trace any limits of future technical potentialities."

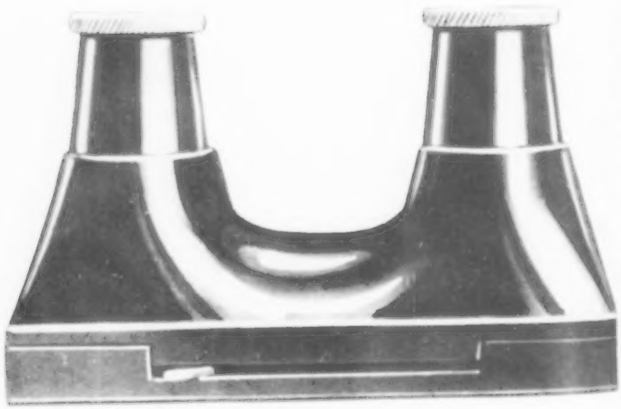
A special pharmaceutical container, designed for the medical profession, made of Bakelite Molded material, and molded by the Kurz-Kasch Company for Eli Lilly and Company.

Here 'tis—that invention for the extruding of the last bit of paste in the tube. The Emeloid Handy Tube Container fills this void well, at the same time providing a handsome and compact container for any type of dentifrice, shaving cream or similar material. The container can be made of almost any material, but the company are preparing to market the device made of Bakelite as well as Celluloid.



Comforting news for the men! This new "Medrec" pipe, as it is called, boasts a wooden bowl, with a Bakelite Transparent stem, and has a filter which is said to do away with all pipe ills. S. M. Frank and Company, Inc., have recently put it on the market.

A simple device, the Perfect-Siphon, which converts a bottle of carbonated beverage into a siphon, constructed of polished metal parts with a body of Bakelite Molded, was recently introduced by the Vaughan Novelty Manufacturing Co.



An ingenious device, this mechanical shaver made of Bakelite Molded, and a positive boon to the domestic element of shaving repute.

Ball-and-ball bearings for steel milling-machine spindle mounted with outer steel as fabricated, are not directly and manufacture accurate rolling operation for longer time. Made of laminated phenolic stock by the Formica Insulation Co.

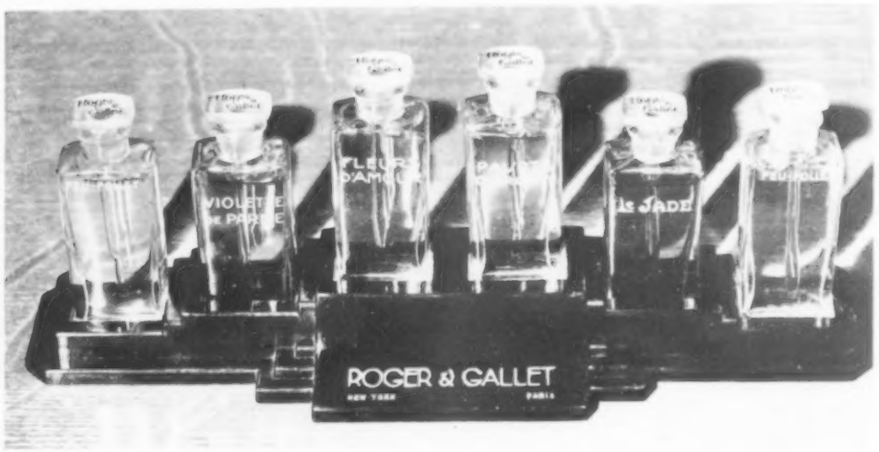
Here again, Catalin handles itself well. As the finishing element to this very practical accessory, it adds eye-appeal and color-selection to utility value. The cord and mounted razorette become a very effective selling display.

Bakelite Molded material used in playing up the more selling points of a product over-emphasized this time in the field of optical instruments.

Ever since the advent of pyroxylin plastics the dream of manufacturers has been to improve on design and construction in connection with medallion and which would achieve a high art standard. Du Pont Viscoloid has accomplished this through the use of Pyralin in a toilet-ware set shown herewith and called the "Strolling Minstrel." The new carved-like decoration has been made possible through a new and patented process of manufacture.

New Plastic Packages

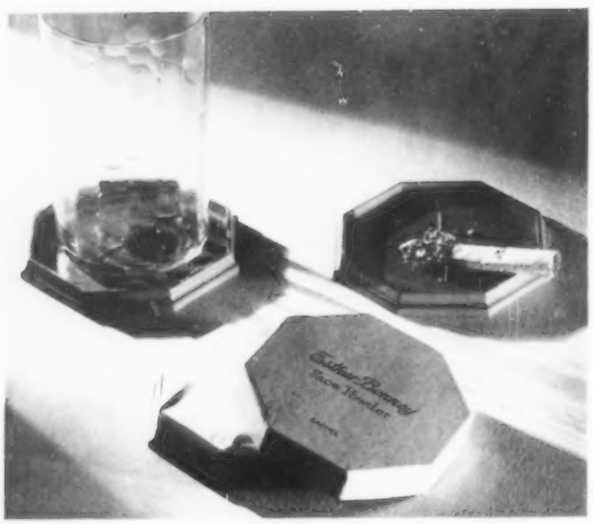
Selected by the Editor of "Drug & Cosmetic Industry" as this month's most outstanding novelties



Enamoredly perfume and toilet water bottles were ordinary. Softness perched better shelter on shelves or in glass cases. Today they are designed with an eye to beauty, and deftly placed on molded plastic stands such as the one used by Roger and Gallet.

Johnson Rutlan Works designed this molded box of dark green Durez for the Silstead Laboratories for packaging their prescribed therapeutic tablets to be known as "Chlorosilsteral." The symbols on the snap-hitting cover indicate the mineral salts used in the tablets.

Even drug sales can be boosted considerably with better packaging as evidenced by the plastic stand of rather severe model yet ideally suited to drug purposes which The Norwich Laboratories are using for their Pepto-Bismol.



And along comes a powder box with a double purpose, used by Esther Bonney, the base of which is plastic and can be used also as a coaster or ash-tray.

Calco

Condensation Black 1630 M

A specially processed black which has been accepted by the electrical industry because of its excellent dielectric properties and lustrous finish. Due to its non-bleeding quality it is also recommended for all types of closures.

We also offer one of the most highly soluble blacks on the market, Condensation Black 1500 V which was especially developed for use in phenolic resin varnishes.

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Analyzing Cellulose

Its Structural Advantages

By Dr. W. J. Jenkins

The British Society of Chemical Industry, held a combined meeting of its London Section and its Plastic Group, on March 6th, and the paper presented at that time by Dr. W. J. Jenkins, Imperial Chemical Industries, Limited, was one of the most interesting and informative recent addresses. The subject covered was entitled "Plastics with Special Reference to Cellulose Material," and it was taken up in such a manner that it was not solely of interest to a producer of these materials, but also to their ultimate users.

In the beginning of his paper Dr. Jenkins discussed the properties of plastic materials, dividing them into three classifications: Thermoplastic, Thermohardening and Chemically Reactive.

It was evident that a fourth class was necessary to embrace those materials which become hardened at relatively high temperatures, and which are not usually included among the Thermohardening group.

In taking up the cellulose materials, Dr. Jenkins went into considerable detail with regard to the structure of cellulose, stating that it was now evident that cellulose is built up of chains of molecular units consisting of glucopyranos molecules linked together by primary valencies, the latteral linkage of these chains being due to cohesional forces usually referred to as the Van der Waal forces. Going further into the structure of these materials, the speaker pointed out how these chains were held together in bundles, in which the chain lengths are parallel. These bundles, or micelles, as they are called, are rigid because of the chain structure.

Various solutions tend to affect the stretching qualities of the chain—as is evidenced in cellulose films—and although cellulose materials are plastic to this extent, they do not undergo plastic flow under heat, consequently cellulose is not Thermoplastic.

Dr. Jenkins took up the two processes of nitration showing that the essential difference between the dipper and the display processes was in the manner in which the nitrocellulose is freed from acid after nitration.

Benzyl Cellulose

In taking up Benzyl Cellulose and the plasticity of various derivatives, Dr. Jenkins presented the most interesting part of his talk, especially from the standpoint of the industrial user. For this reason, we are quoting direct from the abstract of his paper which appeared in the March 17th issue of "Chemistry and Industry."

The formation of ethers of cellulose is considerably different from that of the esters and the manufacture of benzyl cellulose illustrates these main differences clearly. In this case the first step is to form soda cellulose by the action of caustic soda solution. The strength of this varies with the grade of benzyl cellulose required, but usually it is around 18%. Excess of soda solution is used, and this excess is pressed out before reacting further on the soda cellulose. To the soda cellulose is added benzyl chloride and the mass is heated for a number of hours, during which the benzylation of the cellulose takes place. The resulting product is benzyl cellulose with by-products such as benzyl alcohol, dibenzyl ether, sodium chloride. These by-products are removed by washing with water and organic liquids. Thereafter the benzyl cellulose is dried. A similar process may be employed in the manufacture of ethyl cellulose.

Plasticity of Cellulose Esters and Ethers

Plastic materials are of high molecular weight and the evidence available shows that they have in common a characteristic chain structure. In plastic materials, such as phenol formaldehyde, the chains are branched. In the earlier part of the paper reference has been made to the structure of cellulose. The main characteristic of this, that is the long chain, is retained by the derivatives of cellulose. It can be accepted that the consequences of almost all physical and chemical treatment of cellulose is to reduce the chain length, and, consequently, even in the most carefully prepared cellulose derivatives, the tensile strength is lower than that of the parent cellulose. In addition, replacement of the hydroxyl group by an ester or ether radicle tends to lessen the cohesional forces and so reduce still further the tensile strength. Another consequence of this is that the effect of temperature is more marked, and is increasingly so as the size of the ester or ether radicle increases.

The effect of the weakening of the cohesional forces on the thermoplasticity of cellulose derivatives is very important. Reference has been made to the absence of softening in cellulose. In contradistinction to this the softening of cellulose derivatives is one of their marked characteristics, and the higher the molecular weight of the ether or ester radicle (in any homologous series) the lower the temperature of softening. Another effect due to weakening of the cohesional forces by the introduction of radicles of high molecular weight instead of the hydroxyl group is to reduce the rigidity of the cellulose fibre and this effect is noticeable when one handles such products as cellulose stearate and cellulose laurate.

Cellulose nitrate, cellulose acetate, cellulose butyrate, and cellulose laurate are plastic materials in the accepted sense in which plastics are referred to in the molding industry, that is, they soften under heat and pressure, and have a relatively high tensile strength. It is not generally known that nitrocellulose alone, that is without the addition of any other material, is thermoplastic. Indications of its thermoplasticity have been obtained by Dr. Craik of the Nobel Research Laboratories, Ardeer (who has allowed me to refer to this), who has found that nitrocellulose films, when heated at 175-180° C. under oil, lose their shape.

Most other cellulose derivatives are easily recognized as plastics for they can be molded under heat and pressure without the addition of a second material. It is interesting to note that they soften at lower temperatures as the molecular weights of the esterifying acid increases.

A series of interesting figures dealing with the fatty esters of cellulose are given by Hagedorn and Moller (*Cellulose Chemie*, 1931, pp. 29-33); they give the tensile strengths of films of the fatty esters as decreasing from 9-12 kg./sq. mm. for cellulose acetate down to 0.5 kg./sq. mm. for the stearate, while the per cent. elongation is 15-25 for the acetate and greater than 140 for the stearate. The results agree very well with unpublished work by Dr. Craik. The hygroscopicity of the cellulose fatty esters measured at 72% and 100% saturation also decreases as the molecular weight of the fatty acid radical increases, that of the stearate being approximately 1/10 that of the acetate. The water vapor permeability in these cases is parallel with the hygroscopicity.

True Plasticizers

From scientific and commercial aspects the plasticizing of cellulose derivatives is of considerable importance; this applies equally to their use in lacquers, films, and molding powders. The term "plasticizer" is one that is not easy to define and, on the whole, it is safer to use it in the practical sense and not in the scientific sense. We are familiar with the meaning of a solvent, *e. g.*, it is clear what is meant by saying that acetone is a solvent for nitrocellulose. Although it is customary to refer to tricresyl phosphate and castor oil as plasticizers of nitrocellulose the action of each is different.

Tricresyl phosphate is capable of transforming nitrocellulose into a transparent gel, while castor oil alone has no visible effect on nitrocellulose. Nevertheless castor oil is used for maintaining the pliability of films. A useful nomenclature to use in connection with the above is "gelatinizers" for these substances which convert the cellulose derivatives into gels, and "softeners" for those which do not do this, but nevertheless maintain them in a pliable condition. It has been shown that nitrocellulose adsorbs gelatinizers from non-polar liquids (Desmaroux, *Memorial des Poudres*, 1923, 20, 71; 1928, 23, 54), while it shows no affinity for castor oil (a softener) under the same conditions. (Unpublished work by Mr. F. D. Miles and Mr. G. Jones of Nobel Research Laboratories, Ardeer.) The graphical relationship between percentage plasticizer in the non-polar liquid and the quantity of plasticizer adsorbed per gram of nitrocellulose shows the usual type of adsorption curve for compound formation in the case of good plasticizers.

X-ray Diagrams

A gelatinizer can be caused to exude from nitrocellulose by the application of pressure, while changes of temperature are sufficient to cause the exudation of a softener. It is possible to obtain an X-ray diagram of nitrocellulose containing a plasticizer, which differs from the X-ray diagram of its components, but the X-ray diagram of nitrocellulose and softener is similar to that of the nitrocellulose alone. The results indicate the formation of a compound between the nitrocellulose and plasticizer. Camphor and most synthetic substitutes for camphor give changes in the X-ray diagram, which indicate formation of compounds.

In studying new plastic materials it is useful to obtain preliminary experience by investigating the formation and behavior of films of the material. The films are prepared from solution, and for ease of handling solvents of suitable volatility are chosen. Thus, for nitrocellulose, butyl acetate is satisfactory. The solubility of the cellulose derivative in various liquids is an indication of the type of plasticizer that is effective.

The following is an interesting example of this: It is well known that a mixture of ether and alcohol is a solvent for nitrocellulose. The ethyl ether of ethylene glycol (cellosolve) combines in the same compound the properties of an ether and an alcohol, and thus we have in this product an excellent solvent for nitrocellulose. A high boiling solvent, almost sufficiently high boiling to be put in the gelatinizer class, is the amyl ether of cellosolve. Similarly, cellosolve acetate, like ethyl acetate plus alcohol, is a good solvent for cellulose nitrate, and by analogy we would expect cellosolve stearate to be a good gelatinizer which, in fact, is the case, This principle is also illustrated in the ethers and esters of glycerol.

It will be appreciated therefore that gelatinizers have solvent properties, but differ mainly from the solvents in that their volatility is very low. In general, plasticizers should be non-volatile, good solvents for the cellulose derivative, good solvents for resins, odorless, colorless, and neutral. They should not decompose on storage and should be non-hygroscopic. In addition, plasticizers should be non-inflammable or of low inflammability, and it is desirable, as a rule, that they should impart gloss to the plastic. Films and mouldings which do not contain plasticizers are hard and brittle. Plasticizers should give toughness, while all these properties should be permanent.

It would appear to be an advantage that plasticizers should be good solvents for both cellulose derivatives and the resins used in the plastic, since the plasticizer will then help to preserve homogeneity. Further, good solvent power of the plasticizer will tend to prevent its exudation from the film on ageing or on change of temperature. Solid plasticizers are in some cases not satisfactory for there is a tendency for them to crystallize out and this of course causes brittleness. Camphor is exceptional in this respect. Its high volatility makes its use in lacquers unsatisfactory.

Considerable work has lately been carried out in connection with the testing of elongation and tensile strength of lacquer and enamel films. G. W. Rundle and W. C. Norris (American Society Testing Materials, 1923) have examined this factor in connection with the effect of plasticizers on nitrocellulose films. They claim that the retention of distensibility appears to be, within limits, a measure of the life of a film, and that differences between softeners and plasticizers are brought out by stress-strain measurements. Using films of equal thickness they measure the elongation produced by different loads.

Volatility and Evaporation Statistics

Examination of the values for volatility and evaporation indicates clearly why dibutyl phthalate has a more permanent effect as a plasticizer than diethyl phthalate although the latter is initially superior, for, after storage for 56 days at 51.7°C., over 60% of the diethyl phthalate has evaporated while only 5% of the dibutyl phthalate has evaporated. Similarly the permanence of the influence of tricresyl phosphate is explained, for it is practically non-volatile at 51.7° C. Diamyl phthalate is reputed to be a superior plasticizer to the dibutyl derivative and it is worthy of notice that the volatility results given above are in agreement with this. The high volatility of camphor accounts readily for its unsuitability in lacquer films.

Mr. F. D. Miles and Mr. G. G. Jones (unpublished work) have made the interesting observation that nitrocellulose film, when absorbing water, increased in tensile strength to a maximum then falling off as the quantity of water increases, while the elongation passes through a minimum. These investigators observed that acetone causes a fall in tensile strength with increase of elongation. Further, in tests on films containing various percentages of dibutyl phthalate they found that the tensile strength was reduced, and that the lower the viscosity of the nitrocellulose with which they worked, then the lower was the tensile strength of the film containing plasticizer. When plasticizer was absent the tensile strength seemed to be independent of the viscosity of the nitrocellulose over a wide range of viscosities. Using tricresyl phosphate as the plasticizer, the effect was to increase the tensile strength to a slight maximum and thereafter a falling off, being parallel with a slight minimum for elongation.

New Insulating Material

We understand that a manufacturer in Bombay, is manufacturing a hard insulating material similar to Bakelite. The work is being carried out at present on a very small scale, under the direction of a German engineer.

Plastics in the News

Monsanto Buys Swann — British Plastics Exhibit Opens — Lacquer Patent Appeal Scheduled for End of May — Du Pont-Sylvania Products Suit Settled — NEMA Molded Section Meets May 19 — Plioform and Cast Bakelite Discussed Before Molders' Representatives.

Monsanto sprang the prize depression-period acquisition surprise April 20 when President Edgar M. Queeny announced purchase with cash of a control of the voting stock of the Swann Corp. for an unannounced sum. Revising the famous Greeley advice Monsanto came East in 1929, acquiring Rubber Service Laboratories, the Commonwealth Division of Mathieson, and, storming the citadel of New England conservatism, Merrimac. Now firmly believing in the future industrial growth of the South the company has turned to Swann Corp.

The Swann interests within the past five years have acquired Swann Chemical of Birmingham, Provident Chemical of St. Louis, and Wilckes, Martin, Wilckes of Camden, one of the country's oldest lampblack producers. Research has had a champion in Theodore Swann. Besides a long list of more orthodox products his technical assistants have made available di-phenyl and the archlors.

The following eight officers of Monsanto were immediately elected to the Swann Board of Directors; Edgar M. Queeny, Charles Belknap, Gaston du Bois, Theodore Rassieur, J. A. Berninghaus, J. W. Livingston, F. A. Ulmer and G. Lee Camp. The following members of the old board were reelected: Oscar Wells, Chairman, First National Bank of Birmingham; William H. Weatherly, Chairman of the First National Bank of Anniston; Ferdinand Wilckes of Camden; William H. Hassinger, Lindley C. Morton, Theodore Swann and C. M. Jesperson of Birmingham. Mr. Swann was reelected president.

Six Month's Exhibit

On April 5 in the presence of a distinguished group of British industrialists the Parliamentary Secretary to the Board of Education, Herwald Ramsbotham, opened the most complete exhibition of plastics ever to be staged in any country of the world. It is being staged at the Science Museum, South Kensington, London, and will be continued for about six months. Speaker was introduced by Kenneth Chance, managing director of Beetle Products.

News of the deaths of three outstanding executives in the British plastic industry reached this country recently. C. F. Rowsell, Chairman of British Cyanide (parent company of Beetle Products) was killed in an airplane accident in Belgium; Charles P. Merriam, director of British Xylonite, who only retired as managing director in 1927, died at his home in London at the age of 77; and Henry Marks, managing director of United Ebonite Manufacturers, Ltd., died March 28.

New England Council's new products exhibition May 11-12 at the Hotel Statler, Boston, attracted wide attention. O. F. Benz, du Pont Cellophane sales director, was a speaker at the conference.

Coatings

Oral arguments in appeal of lacquer patent suit brought by du Pont against Glidden will be heard in U. S. Circuit Court of Appeals for the Second District, N. Y., either during third week of May before Justice Chase, A. N. Hand, and L. Hand, or during first week of June before Justices Chase, Manton, and Swann. Suit was won in the lower court by Glidden.

George H. Lincks, varnish gum importer, N. Y. City, celebrated his 44th anniversary in gum business, April 25.

Despite decline in Italian demand for cellulose lacquers, the S. A. Duco of Milan was able to increase its output by 68 per cent. on that of 1931, and by 167 per cent. on that of 1930. Motor industry was the principal market. Company has commenced manufacture of glyceryl phthalated lacquers, and has erected for this purpose large new plants in its works at Avigliana.

Bakelite's Bender on Resins

Speaking on research advances in resins, widely used in the varnish and lacquer industries, Dr. Howard L. Bender of Bakelite, declared, before a recent meeting at Columbia, so many resins already had been found that a new one occasioned neither surprise nor elation. He discounted claims of great merit for new resins as "generally lacking commercial confirmation."

Dr. Bender's address was delivered before the Societe de Chimie Industrielle, N. Y. Section A. C. S.; A. I. C.; American Electrochemical Society; and N. Y. Section of the Society of Chemical Industry.

"Making a new resin," he said, "is almost as simple now as, for instance, making a new undescribed salt of barium; that is, one simply chooses an acid the barium salt of which has not yet been described, and then proceeds to publish the results of the chemical labor.

"However, to find an industrial use within an accepted price range relating thereto is something of great importance. This acceptable price range for delivered properties is the rock upon which most of the new resins and resinoids are wrecked."

Paint, Varnish and Lacquer Sales: February

Sales of paint, varnish and lacquer products in February totaled $12,348,480 in value, according to preliminary report by U. S. Bureau of Census from data supplied by 588 establishments. This compared with $11,949,950 in January and $16,270,822 in February last year. A record of sales in February, compared with revised figures for January and sales by months during 1932, follow:—

	Total sales reported by 588 establishments	Classified sales reported by 344 establishments — Industrial sales — Total	Paint and varnish	Lacquer	Trade sales of paint, varnish lacquer	Unclassified sales reported by 244 establishments
1933						
January*	$11,949,950	$3,529,916	$2,386,977	$1,142,939	$4,172,580	$4,247,454
February†	12,348,480	3,419,755	2,440,896	978,859	4,775,416	4,153,309
1932						
January	15,894,506					
February	16,270,822					
March	19,089,005		Comparable statistics not available.			
April	22,612,193					
May	24,981,441					
June	19,637,358	4,685,399	3,617,719	1,067,680	8,734,330	6,217,629
July	14,430,122	3,793,245	2,900,707	892,538	6,058,813	4,578,064
August	16,032,441	3,851,028	3,057,096	793,932	6,918,659	5,262,754
September	16,805,712	3,980,564	3,113,303	867,261	7,216,748	5,608,400
October	15,592,377	3,996,500	3,636,323	960,177	6,610,011	4,985,866
November	13,260,328	3,599,319	2,639,362	959,957	5,196,766	4,464,243
December	10,127,780	3,222,770	2,186,706	1,036,064	3,506,715	3,398,295
Totals, year	$204,734,085					

*Revised. †Preliminary.

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Articles molded with Resinox are distinguished by all those characteristics which go to make up fine quality: uniform color—freedom from blemishes—enduring strength. For molding material of the finest quality

Specify Resinox

MOLDING RESINS • MOLDING COMPOUNDS • LAMINATING VARNISHES

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RESINOX CORPORATION
A Subsidiary of Commercial Solvents Corporation
and Corn Products Refining Co.
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FINE HEYDEN CHEMICALS

FORMALDEHYDE
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HEXAMETHYLENAMINE

Long experience in the manufacture of these products enables us to meet the individual requirements of the Plastic Trade.

HEYDEN CHEMICAL CORPORATION

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Factories
GARFIELD, N. J. PERTH AMBOY, N. J.

Resins Defined

Resin-like residues may be obtained from almost any organic chemical reaction series that tends to give a mixture of fairly similar solid products, Dr. Bender pointed out. He defined resinous properties as physical, rather than chemical, since a resin is any organic mass which displays a wide range of melting temperature and breaks with a conchoidal fracture.

Resins, Dr. Bender explained, are the "organic glasses" and have some of the virtues and faults of ordinary window glass with "some redeeming features and faults all their own." Resinous masses, he added, differ from their pure components in much the same way that metallic alloys differ from the pure metals.

"While in industrial practice," he went on, "a resinous mass is mainly one desired resin, yet the properties of the mass are often varied in a desired direction by admixture with other chemicals dissolved therein. Moreover, the resin chemist must never forget that now sufficient data is available so that one can practically duplicate the properties of any desired resin by means of mixtures of entirely different compounds."

Frank Breyer, Singmaster & Breyer, N. Y. chemical consultants, spoke before the N. Y. Paint and Varnish Production Club at its April meeting held at the Western Universities Club on the synthetic resin patent situation. Singmaster & Breyer were retained by the group opposing the so-called Flaherty lacquer patents of du Pont. They have been active in the test case between Glidden and du Pont. The latter lost in the first trial and hearings in the appeal are scheduled to start in Brooklyn late in May.

Toney Carter, 56, vice-president of the Schaefer Co., Louisville lacquer manufacturer, died April 7 at his home in Nashville of heart trouble after an illness of two years.

Hercules Mixer (houseorgan of Hercules Powder) features on back cover "ad" stressing importance of using high percentages of nitrocellulose in lacquer formulas for good results.

A. J. Wittenberg of Stroock & Wittenberg, N. Y. City, representing Paramet Chemical, manufacturers of ester gums and synthetic resins was guest speaker at the April meeting of the California Paint and Varnish Production Club held in San Francisco.

Dr. Isaac Wyman Drummond, 78, retired chairman of the board of Devoe & Raynolds and noted paint chemist, died April 15 at his home in N. Y. City. He was a son of James F. Drummond, a founder of Devoe & Raynolds.

C. M. Durbin Co., 49 Central ave., Cincinnati, are sales agents for Glyco Products.

Cellulose

Settled Out of Court

A settlement out of court has been reached in suits brought by Du Pont Cellophane against Sylvania Industrial Corp. in District Courts of Delaware and Virginia for infringement of patents owned by Cellophane Company and covering moisture-proofing of Cellophane. Sylvania Industrial Corporation has taken a license under Du Pont Cellophane Company's patents for manufacture and sale of moisture-proof regenerated cellulose. Du Pont Cellophane's patents as granted by Patent Office broadly cover new moisture-proof articles and also process and apparatus for making them.

Production Figures

Following table presents monthly statistics relating to pyroxylin-coated textiles based on data reported to the Bureau of the Census by 19 (a) identical establishments comprising most of the industry. Data given include products manufactured by spreading nitrocellulose or pyroxylin preparations, either by themselves or in combination with other materials, upon grey goods, such as sheetings, drills, ducks, sateens, moleskins, etc. Monthly capacity of the 19 establishments, amounting to 11,950,064 yards, in March, is based on a maximum quantity of 1.27 to 1.30 sateen, coated to a finished weight of 17½ ounces per linear yard, in a 24-hour working day, 26 days to a month.

	1931 *March*	*1932* *March*	*1933* *February*	*1933* *March*
Light Goods:				
Shipments—				
Linear yards	1,589,817	1,317,201	1,243,184	1,195,658
Value	$488,423	$303,548	$255,337	$240,040
Unfilled orders (b)—				
Linear yards	1,162,406	879,149	870,415	792,122
Heavy Goods:				
Shipments—				
Linear yards	1,803,846	954,254	884,987	883,558
Value	$1,069,075	$480,321	$395,657	$383,515
Unfilled orders (b)—				
Linear yards	2,195,837	1,780,956	1,317,494	1,199,484
Pyroxylin Spread (c):				
Pounds	4,081,199	2,548,896	2,374,290	2,333,083

(a) Of the 19 establishments reporting for March, 1933, two establishments did not report prior to January, 1933.

(b) Orders on hand at the close of the current month (reported in yards only) exclusive of contracts with shipping dates unspecified.

(c) Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8-lb. jelly.

Monthly production of transparent cellulose paper in Japan is 1,500 reams of 500 sheets, of which 95 per cent. is consumed in home market. Industry is represented by Osumi Serchan Kaisha at Tsuruga, the first in the field, by the Toyko Serchan Kaisha, the Shewa Chemical Industry Works, which is affiliated with the Mie Rayon Manufacturing Co., by the Kinshibori Works, a subsidiary of the Katakura Silk Ruling Co., and by several others.

For Books

Du Pont (Fabrikoid Division) has just issued new booklet bound in du Pont Fabrikoid PX Cloth telling the complete story of the introduction of this pyroxylin bookbinding material late in 1932 and illustrating and listing names of a large number of new books bound with it. Of special interest is the fact that the first foreign shipment was made late in March of this year.

Du Pont Fabrikoid Fairfield, Conn., has recalled 45 men, making a total of 260 employed. Plant is operating 40 hours weekly, manufacturing at 45 per cent. of capacity.

Du Pont Cellophane plant at Ampthill, Richmond, Va., is maintaining its five-day

PYROXYLIN SHEETS, RODS, AND TUBES

Bureau of the Census presents in the following table monthly statistics on production and shipments of pyroxylin sheets, rods, and tubes, based on data furnished by nine identical establishments.

Production and Shipments in Pounds

Year and Month	*Sheets* *Production*	*Sheets* *Shipments*	*Rods* *Production*	*Rods* *Shipments*	*Tubes* *Production*	*Tubes* *Shipments*
1932						
January	931,485	890,221	145,145	171,619	56,828	23,431
February	1,148,592	928,066	159,290	144,530	43,509	44,030
March	968,977	845,550	132,430	101,513	69,352	43,739
April	851,145	743,698	80,863	104,662	29,723	24,070
May	659,028	664,585	85,879	84,635	22,795	20,771
June	630,384	572,958	78,792	80,212	25,915	22,150
July	389,115	540,874	64,662	68,818	11,875	20,279
August	539,953	691,390	141,608	125,891	13,735	25,227
September	801,870	941,051	155,423	163,442	29,080	32,703
October	940,231	1,007,355	134,980	187,597	33,175	46,988
November	838,967	818,125	143,731	154,435	25,709	52,410
December	712,601	787,121	71,696	104,729	17,720	26,743
Total (Year)	9,412,348	9,430,994	1,394,499	1,492,083	379,416	382,541
1933						
January	635,078	752,832	75,707	119,098	14,070	29,369
February	597,121	687,672	80,828	101,903	23,092	25,741
March*	535,271	687,474	65,422	90,579	17,582	32,583

*One firm not reporting.

CASEIN PLASTICS

NON-INFLAMMABLE

SHEETS & RODS

MADE IN BEAUTIFULLY MOTTLED AND PLAIN COLORS

American Plastics Corporation

50 UNION SQUARE, NEW YORK CITY

THIS steamer headpiece was molded by us of green Bakelite for the Charles Arnao Company, manufacturers of Beauty Parlor Equipment. It is 22″ overall, $10\frac{3}{4}$″ wide and $9\frac{3}{4}$″ deep,—a good sized and somewhat intricate molded piece. The trim, in lighter shade of green Bakelite exactly fits the irregular contour of the headpiece and serves as a support for it.

Attractive in color, light in weight, resistant to moisture, acids, oils, etc., and an excellent insulator of heat and electricity, it is a decided improvement over the usual metal headpiece.

Can your product be improved by the use of Bakelite Molded Parts? Why not consult our engineers.

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CHICAGO MOLDED PRODUCTS CORP.

2146 Walnut Street Chicago, Ill.

work week with three shifts employed. There has been no slackening in demand for Cellophane wrappers, it is learned. In fact, speeding up in cigarette manufacturing is expected to help the cellophane industry.

Cellulose Glues

A new building exclusively for the manufacture of transparent cellulose glues, gums and cements has been erected by National Adhesives, N. Y. City, world's largest producer of adhesives. New building, which also contains a complete experimental laboratory, adjoins company's factory at Dunellen, N. J.

Dominant position of transparent cellulose tissues in packaging today, and resulting demand for company's products to seal them, has made necessary this expansion of its production facilities, according to A. D. Fuller, head of National Adhesives' manufacturing department.

"Our laboratories," said Mr. Fuller "have for many months been engaged in working out the answers to more intricate problems. They have, for example, perfected gums and cements for sticking moisture-proof tissues to fabrics of various types—a progressive step which should open up entirely new merchandising fields for fabric manufacturers and converters.

"In addition, we have developed gums for laminating cellulose tissues not only to themselves, but also to papers of a number of different kinds, to produce effects hitherto unobtainable. By laminating a printed or lithographed paper to a sheet of moisture-proof transparent cellulose, for instance, a serviceable moisture-proof wrapper with both practical and artistic value may be produced. Gums used for such a process must, of course, have unusual transparent properties and must hold the cellulose tissue with uniform adhesion throughout the sheet, without puckering or curling.

"Laminated papers of this type lend themselves particularly well to decorative purposes such as the making of lampshades, table scarfs, and the like, and it is quite probable that many cellulose-covered materials may be placed on the market in the near future."

Molded

Representatives Meet

Another enthusiastic meeting of the Molders' Representatives Group was held May 10 at the Machinery Club, N. Y. City. Through the efforts of Boonton Molding's C. J. Groos a splendid program was arranged including H. R. Thies of the Goodyear Rubber research division who told the molders just what possibilities the new rubber thermoplastic "Plioform" offered them in the way of new effects, and A. Zimmerman of Bakelite who spoke on the newer uses and possibilities of cast Bakelite.

In Attendance

Those attending included, G. E.'s Falk; American Insulator's Broumel; American Record's Klein; Kuhn & Jacobs Machine & Tool's Amdury; Northern Industrial Chemical's Meacham; Garfield Manufacturing's Walker; Bakelite's Vaill and Scott; Shaw Insulator's Ryder; Booton Molding's Harkness; Diemolding's Boller; and Mack Molding's Howell. Mr. Thies of Goodyear was accompanied by A. Teas of the same company.

Attendance at the Group luncheons is increasing, and a cordial invitation is given to all molder representatives to attend future meetings. Details can be obtained from C. J. Groos of Boonton Molding.

NEMA Section—May 19

Douglas Woodruff, president, Auburn Button, and chairman of the Molded Insulation Section of NEMA, has called a meeting of the section for May 19 at 1.45 p. m., at NEMA headquarters, 570 Lexington ave., N. Y. City. A special program has been arranged and all molders are urged to attend.

In Full Operation

Synthetic Moulded Products' new plant at Stonington, Conn., has installed all new equipment, including 11 presses varying in capacity from 50 to 320 tons. Production is under the immediate direction of O. W. Greene, Jr., president.

From a Contemporary

"There is much that the average plastic molder can do to improve the appearance of his moldings pending the millennium when industry buys good designs as a matter of course." From a pithy article on "Designing" appearing in the May issue of General Plastics' *Durez Molder*.

Licensed

Waterbury Brass Goods, Waterbury, Conn., has been granted license to manufacture radio contact pins under patents owned by Bead Chain Manufacturing, which also includes an arrangement whereby molders of radio tube bases can secure licenses to mold radio pins into radio tube bases under the Bead Chain Manufacturing patents Nos., 1,702,234 and 1,886,176.

Carbide's "Age of Plastics"

Carbide will exhibit a wide variety of products at the Chicago "Century of Progress" including complete welding equipment, synthetic organic chemicals and also the "Age of Plastics"—an entire section devoted to "Vinylite" plastics. In the Hall of Science, "Fair" management has planned to set up huge "Periodic Table of Elements," in which will be collected in one place for the first time, specimens of all known chemical elements. In search for these specimens, it was found that Carbide is the only practical source of a large percentage of the 92 elements. Almost one-half of these are being furnished by Carbide.

Beetleware Corp. (Cyanamid) advertised several unusual items in the premium exposition number of *Printers' Ink*. The "Wheaties" Beetleware cereal bowl was featured in the back-cover "ad" of the *Saturday Evening Post* out April 22.

Fabryka Kabli (Cable Manufacturing Plant), Krakow, Poland, recently started production of a phenol-formaldehyde type of synthetic resin.

Frank H. Shaw of Shaw Insulator sailed April 26 on the Queen of Bermuda for a two weeks stay. Mr. Shaw has been in ill-health for over a year.

Bakelite Booklets

New denture plastic material, Luxene, is described in Bakelite Information, current issue. Product distributed by Ransom & Randolph, Toledo, has natural color of skin tissue, great strength and is without odor or taste.

Bakelite Review for April features the story of Revolite, new flexible waterproof cloth in addition to the usual number of new and novel uses well illustrated by pictures.

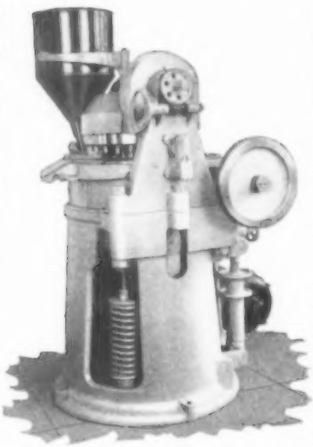
Laminated

New G. E. Introduction

New cable insulated with Glyptal-treated cloth and capable of resisting oil and withstanding high temperatures has been developed by G. E., and is now available in all types. In addition to its ability to resist oil and heat, this new cable is characterized by unusual flexibility and toughness that enables it to stand severe mechanical strain.

Insulating material known as Glyptal is a synthetic resin, produced from phthalic anhydride and glycerine, which in unaffected by mineral oil. Because of this inherent quality, Glyptal-treated cloth has a distinct advantage over varnish-treated cloths as an insulation material. This new cloth also maintains its original properties over long periods of time, even at elevated temperatures. Samples of cable insulated with Glyptal-treated cloth have been exposed to temperatures of 100° C. for periods of three

NEW Two STOKES ROTARY PREFORM PRESSES



"DDS-2"

For compressing preforms and industrial products of various shapes including the ball.

Capacity—350 per minute; die fill up to 2″; diameter of preforms —up to $1\frac{3}{16}$″.

THESE PRESSES GIVE—

Accuracy in Weight
Die cavity overfilled, excess scraped off before compressing.

Uniformity in Density
Controlled slow squeeze from both sides simultaneously instead of sudden blow.

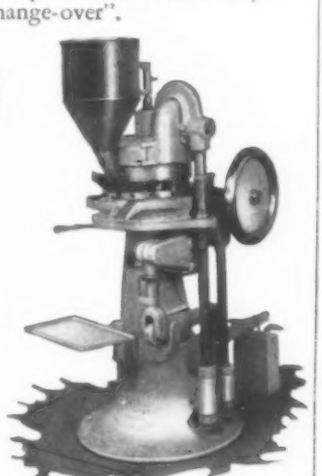
Freedom from Jamming
Excess Pressure Release spills overloads and absorbs strains.

Economy of Operation
Dust collecting nozzles and housed moving parts minimize wear and loss of material.

Convenience
Handwheel adjustments for weight and density; punches simply lift out.

Flexibility
Use as many pairs of punches and dies as job warrants. Quick "change-over".

Other Features: — *Can be furnished for special shapes; quiet, compact, and rugged; conveniently motor driven.*



"DS-2"

For smaller preforms, tube closures, buttons, etc.

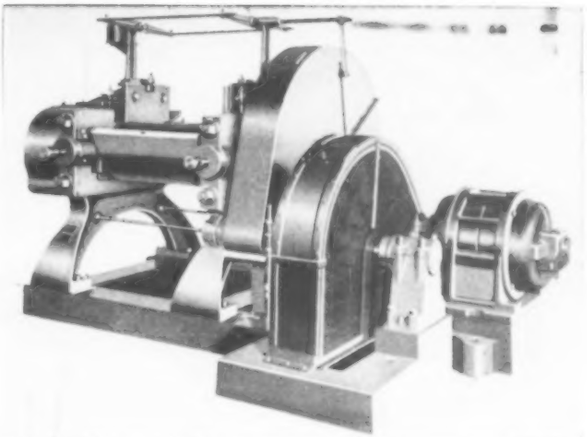
Capacity—200 per minute; die fill up to $1\frac{1}{16}$″; diameter of preforms —up to 1″.

Write for Information

F.J STOKES MACHINE COMPANY

Process Machinery Since 1895

5934 Tabor Road Olney P. O. Philadelphia, Pa.



Rolls for Plastic Mixing

FOLLOWING CARRIED IN STOCK

6 x 16
10 x 24
14 x 30 *(illustrated)*
16 x 42

Specially designed for mixing Durez, Bakelite, Asphalts and Shellac compound materials.

The largest and oldest manufacturers are using our machines.

WM. R. THROPP & SONS CO.

TRENTON, N. J.

Established 1888

to four months without showing appreciable deterioration. Cloths treated with varnish, under the same test conditions, deteriorate rapidly by comparison. Despite fact that some varnish-treated cloths have a dielectric strength slightly higher than that of Glyptal-treated cloth, latter retains its dielectric strength for a longer period of time under such mechanical abuse as compression, bending, and abrasion.

Cable insulated with Glyptal-treated cloth can be used advantageously for low- and medium-voltage leads, apparatus cable, transformer leads, leads for coils and control devices, or wherever an oil-resisting, heat-resisting cable is required.

April issue of *The Architectural Record* contains an interesting article on waterproof plywood laminated with phenolic resins.

Casein Manufacturing Co. of America, N. Y. City, is now producing an elastic glue made of latex and casein that permits perfect lamination of wood and metal.

Solvents

Commercial Solvents filed April 7 petition with Federal Court at Wilmington asking that Union Solvents be adjudged in contempt of court and made to pay a penalty.

Petroleum Solvents

Dr. Gustave Egloff, Universal Oil Products, will present a paper "Synthetic Petroleum Products "before a joint meeting of the four N. Y. Sections of the technical societies (Society of Chemical Industry; A. C. S.; Electrochemical Society; Societe de Chimie Industrielle) May 12 at the Chemists' Club.

U. S. I. opened its Peoria grain alcohol distillery (estimated daily capacity 10,000 gal.) on April 15. F. J. Rich is plant superintendent.

E. M. Toby, Jr., is now in charge of the southern sales office of American Mineral Spirits, 724 1st National Bank Bldg., Atlanta.

Resistant to Solvents

A reaction product of ethylene dichloride and calcium polysulfide "Ethanite" has been placed on the market by the British firm of Wilfred Smith, Ltd., London. Material is said to have the property of resisting the action of nearly all solvents, oils, fats, etc.

Machinery

New Battery

Brown Instrument, Philadelphia, has developed new type of battery for use with Brown Potentiometer, which eliminates frequent standardizing. This new battery, Brown Compensated Air Cell, having a constant current output and a life of over two and one-half years assures potentiometer user of continuous accuracy with minimum attention. It can be used with all types of Brown Potentiometers. A bulletin describing the Brown Air Cell can be obtained from the manufacturer.

H. P. M. Radial Pumps

Hydraulic Press Manufacturing, Mount Gilead Ohio, builders of H-P-M Hydro-Power Presses, are marketing new and complete series of radial pumps for generating pressure in operating hydraulic powered machinery. Such machines include many types of presses and machine tools, also welding machines, steel mill machinery, testing machines, and many others. New H-P-M Pump is particularly suited for application to heavy duty production machines requiring high pressures.

This H-P-M Pump is the positive displacement, multiple radial plunger, oil pressure type in which a number of new and important inventions are incorporated. Output is both variable in volume, and reversible in direction of flow, which characteristics are utilized to full advantage with the aid of H-P-M Pump Controls for the most economical transmission and application of hydraulic pressure.

These H-P-M Heavy Duty Radial Pumps are built in six sizes, ranging from 1 GPM per minute to 100 GPM per minute, with pressure capacities up to 3,000 lbs. per square inch, to meet every machine drive requirement. All features of the design are covered by patents or pending applications.

John Robertson Co., 121 Water st., Brooklyn, N. Y., manufacturers since 1858 of all types of hydraulic machinery, has just issued Vol. 1, No. 1 of a new house organ, "Robertson Reminders."

New Devine Service

N. Y. Engineering is now fabricating material for C. P. Devine Co. Latter has started new service to manufacturers, making complete technical and economic surveys of existing plants and equipment. Further details may be obtained by writing company's offices at 25 W. 43 st. N. Y. City. Robert ("Bob") Holliday has been added to the company staff as a consultant.

Commonwealth Electric & Manufacturing, 83-105 Boston st., Boston, Mass., has just issued catalog describing new line of small steam boilers electrically heated in capacities from 1-5 up to 8¾ boiler horse power (2 to 90 kilowatt).

Stein-Brill Moves

Stein-Brill, machinery and equipment dealers, moved offices and warehouses May 1 to 183 Varick st., N. Y. City. George G. Rodgers Co., an associate company of Stein-Brill Corp., manufacturers of new filling and mixing machinery, are at same address. This company has leased over 20,000 feet for the incorporation of warehouse and offices under one roof. This has been done for the convenience of their customers.

The present warehouses of the company located in Jersey City will be continued in conjunction with the new warehouse until such time that most of the machinery have been moved to the new premises. The Stein-Brill Corporation now claims to have the largest facilities of its kind in N. Y. City.

Casein

Argentine Exports

Unofficial estimates place exports of casein from Argentina at 17,668,766 kilos in 1932, indicating an increase of 22 per cent. in comparison with the 1931 total of 14,454,752 kilos. There were no imports in 1932 to Russia, which took 1,120,696 kilos in 1931. Destinations of larger shipments in 1932:

	Kilos
Germany	9,685,344
United Kingdom	2,094,751
Netherlands	1,167,110
Japan	1,146,210
Finland	773,800
Sweden	663,910
Spain	657,075
United States*	318,780
Belgium	214,350
Lithuania	125,220
Norway	77,240

*Exports to the United States in 1931 amounted to 1,352,910 kilos.

Number of Italian producers of casein plastics has been reduced from three to two by voluntary liquidation of Galakerit Co. of Milan, which had a capital of 1.2 million lire. Total Italian production of these materials in 1930 was 450 tons, products of the other two factories being sold under trade names of "Protiolit" and "Zoolit."

Casein prices have been advancing sharply in the past two months.

Formerly an important buyer of Kauri gum, U. S. took practically nothing during 1932. New Zealand's shipments for the year were 2,078 tons, against 3,019 tons in 1931 and 3,653 tons during 1930.

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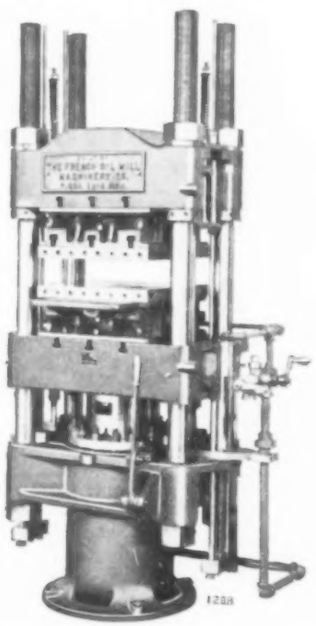

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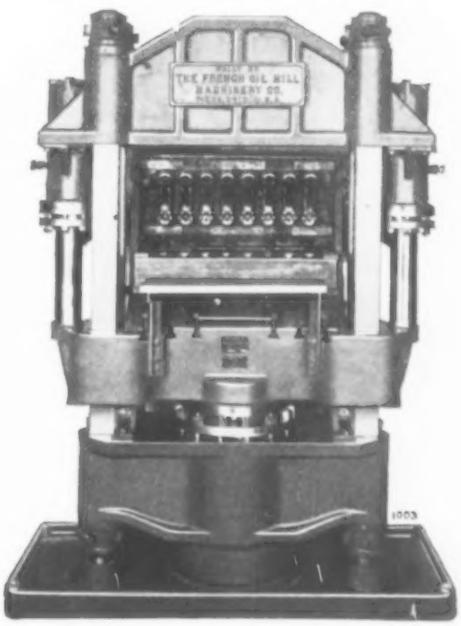

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Personnel

Dwight Cook has become sales manager of the Toledo Synthetic Products Company, Toledo. He was formerly Detroit representative of *Power* and other McGraw-Hill publications.

Charles Pack and Louis H. Morin have opened consulting offices under firm name of Pack-Morin, Inc., 261 5 ave., N. Y. City. They will offer a complete engineering service. They are also specialists on cellulose products.

George Moran, former chief chemist, Pacific Print Works, Lawrence, Mass., has joined sales technical service division of Calco, replacing C. A. Funke, who resigned to join Nova Chemical. In new capacity, Mr. Moran will direct technical service division of Calco and has established headquarters at Bound Brook.

Edwin A. Robinson is now with Tennessee Eastman, Kingsport, Tenn., working on experimental production of cellulose acetate yarn.

Company News

Monsanto's official name on and after June 1 will be Monsanto Chemical Co.

Foster D. Snell, Inc., chemists-engineers, have moved to 305 Washington st., Brooklyn.

Interstate Color moved from 41 Park Row to 5 Beekman st., N. Y. City, May 1.

Foreign Viewpoint

Introduction of synthetic materials in paint manufacture in recent years has caused much speculation in Britain as to the lines on which the paint industry will develop in future. This matter is the subject of a special survey in the trade and engineering supplement of *The Times*, wherein it is stated that the natural basic raw materials, such as linseed oil, turpentine, and gum-resins will continue to be used for some years provided their price remains at an economic level. At the same time, it is pointed out that synthetic materials made from cheap raw products will continue to play an increasingly important part in the industry.

It is considered that in the future paints of all types, whether for metal, wood or plaster, will be used almost entirely for embellishment and decoration, as the importance of their protective function will gradually decline with the solution of the problem of corrosion, especially in respect of metals. In addition, it is indicated that the day may come when all main walls, interior and exterior, will be "poured" or molded from special types of suitably colored concrete, plaster or other material, and that in this way not only the requisite structural strength, but also a matte finish of pleasing color and unlimited permanence will be secured.

Among other points to which reference is made are the peptizing and fermentation of starches and sugars for the production of solvent liquids and the possibility of the displacement of natural turpentine as a diluent. While this survey admittedly frequently looks far ahead, the tendencies to which it draws attention are of undoubted importance to both manufacturers and users of paint, paint materials, and synthetic resin materials. Another statement of great interest to the plastics industry is the surmise that greater use will be made in future of colored sheets of non-inflammable celluloid.

Future Possibilities

One hundred million tons of pure cellulose, 6,000,000 tons of sugars, and large quantities of gums and lignin are contained in 300,000,000 tons of cornstalks, cotton stalks, and straw, annually discarded as waste by American farmers, it was disclosed by chemists of U. S. Bureau of Standards before Washington 85th meeting of the A. C. S.

Great potential value was ascribed to the waste products in a summation of the Bureau's findings, prepared by Dr. S. F. Acree and his co-workers, H. A. Hamm and Mary T. Kanagy.

Importance of the Bureau's work, according to Dr. Acree, lies in the fact that while producing cellulose from farm wastes, it is possible to recover non-cellulose constituents of raw materials used. Methods now generally employed for the production of cellulose, he added, have neglected these by-products.

While the manufacture of cellulose from farm wastes is not yet commercially successful, Dr. Acree pointed out that the research at the Bureau of Standards is "only in its beginnings" and its possibilities "cannot be forecast." He added that cellulose, besides being the chief constituent of paper and rayon, is extensively used in the manufacture of many other products, including explosives, cellophane, photographic films, lacquers, and adhesives.

"A very high grade of cellulose," Dr. Acree explained, "is obtained by washing waste material with water to remove dirt, so that a clean product may be obtained, and then cooking it under pressure successively with water, dilute sulfuric acid, and lye. Pulp is then agitated in chlorine gas, cooked again with lye, and bleached with a solution of bleaching powder.

"One criterion of a cellulose is its content of 'alpha cellulose'—supposed to be the pure cellulose. Pulp obtained by the process described contains from 95-98 per cent. of 'alpha cellulose.'"

When the raw material is cooked with water, Dr. Acree continued, several other classes of materials, known as gums because of their adhesive properties, are dissolved out. These, he suggested may find future uses as binding materials for various purposes.

Further cooking of the farm wastes under pressure with dilute acid makes possible the extraction of certain sugars, Dr. Acree disclosed. The most abundant, "xylose," is not as sweet as cane sugar and questions as to its digestibility and food value "have not yet been definitely answered."

"However," he went on, "it can be converted readily into various useful products such as resins, solvents, and other chemical products. Researches are now in progress in various institutions, both in this country and abroad, looking to the development of uses for this material.

"Besides the gums and 'xylose,' there occurs with the cellulose in these plants a complex material known as lignin, which is found abundantly in mature plants and can be obtained as a solid by-product in the cellulose process described by adding an acid to the alkaline liquors resulting from the cooking of the fibrous material with caustic soda. The lignins are filtered out of this solution."

New Service

Drug, Chemical and allied trades section of N. Y. Board has just completed a digest of the new retail sales tax which will be imposed upon receipts from sale of tangible personal property as of May 1. "Legislative Bulletin No. 1 is the beginning of a service which has been started with the idea of informing members of the section of various legislative measures effecting chemical and drug industry.

Tariff Commission has just released "Analysis of Imports for Consumption of Certain Chemicals and Similar Products" not specially provided for "in the Tariff Act of 1930."

Binney & Smith report further improvement in the physical condition of dustless "Micronex" special carbon black in pellet form.

B. F. Goodrich has a new rubber lined valve known as the Vulcalock valve, which is designed for handling corrosive and abrasive fluids under conditions of fairly high pressure, pulsating pressure, throttling or suction.

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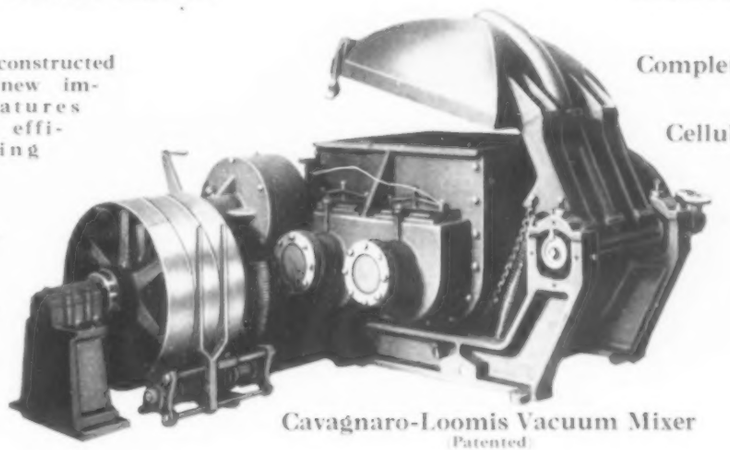

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Plastic Patents

Abrasives

Abrasive grains in natural resin of plant origin, combined with phenol and hardener. No. 1,907,088. E. E. Novotny to Joseph S. Stokes.

Improved abrasive coating material secured by cellulose-rubber film. No. 1,904,663. H. L. Morris, to Rucel, Ltd., London.

Cellulose

Composite sheet material of fabric with thermoplastic cellulose derivative. Impermeable. No. 1,903,960. Camille Dreyfus.

Process for removing sulfur from cellulose acetate, under super-atmospheric pressure. No. 1,903,961. C. Dreyfus and George Schneider.

The making of cellulose or cellulosic materials by chemical reagents and inert gases or vapors. No. 1,903,962. Henry Dreyfus.

Method of improving cellulose raw material of all kinds. No. 1,904,235. Hottenroth and Faust (Germany).

Method of manufacturing articles from celluloid and the like. No. 1,904,289. Neidich and Mendel.

The manufacture of tapered tubes of celluloid open at both ends. No. 1,904,290. Samuel A. Neidich.

Process and apparatus for the manufacture of cellulose from raw materials. No. 1,904,894. Daniel Westad (Norway).

Cellulosic composition of matter containing a dialkyl hydrophthalate. No. 1,905,516. H. B. Smith to Eastman Kodak Co.

Cellulose ester composition, with a derivative of saturated aliphatic hydrocarbon. No. 1,905,517. H. B. Smith to Eastman Kodak Co.

Composition of organic cellulose and a BB-dialkoxy ethyl carbonate. No. 1,905,518. H. B. Smith to Eastman Kodak Co.

A firm, relatively hard composition, constituting a modifier for cellulose acetate plastics. No. 1,905,535. Walsh & Caprio to Celluloid Corp.

Process for the hydrolysis of cellulose acetate. No. 1,905,536. Webber & Staud to Eastman Kodak Co.

Process for the hydrolysis of cellulose acetate. No. 1,905,537 Webber & Staud to Eastman Kodak Co.

Cellulose thiourethanes and process for making them. No. 1,906,910. Leon Lilienfeld (Vienna.)

Coatings

Shellac substitutes. Combined hydroxy-carboxylic acids with halogen and resinolic acid. No. 1,903,598. Scheiber & Dux (Germany).

Treatment of China-wood oil, under temp. of 625°F. producing liquid ungelled oil. No. 1,903,686. F. M. Reece to O'Brien Varnish Co.

Wood filler; coating composition of polyhydric acids resin, wood filler, cellulose overcoat. No. 1,903,768. P. S. Kennedy to Murphy Varnish Co.

Synthetic resin coating, finished by surface film of nitrocellulose and a synthetic resin of the phthalic anhydride glycerine type. No. 1,904,417. F. M. Crystler, to Jones-Dabney Co.

Nitrocellulose, urea-formaldehyde condensation products and castor oil—for lacquers, films, etc. No. 1,904,528. Pungs & Eisenmann, to I. G. F.

Laminated

Decorative laminated product, with printed design on transparent outer surface. No. 1,904,718. J. D. Cochrane, Jr., to Formica Insulation Co.

Compressed fibrous products, of veneered sheets bound by phenolic condensation product. No. 1,905,225. A. Hawerlander to Halizite Corp.

Improvement in manufacture of laminated glass by burning intersheet to the edge of laminated. No. 1,905,430. E. M. Ball to Libey-Owens-Ford.

Composite glass; cellulose ester plastic sheets with joining layer of soft synthetic resin, etc. No. 1,906,474. M. L. Macht to Duplate Corp.

Apparatus for making composite glass. No. 1,906,821. J. H. Sherts to Duplate Corp.

Phenol, Etc.

Method for phenol-formaldehyde resins, of an alkaline earth metal base. No. 1,903,809. Carleton Ellis to Ellis-Foster Co.

Condensation product from halogenated phenols and aldehydes. No. 1,906,890. Weiler, Wenk, Berres & Stotter, to I. G. F. (Germany).

Plastic Compositions

Sealing composition of water, casein, glue, glycol, titanium oxide, etc. No. 1,904,445. D. M. Gray, to Hazel-Atlas Glass Co.

Resinous emulsion, in process for synthetic rubber-like material from polymerizable hydrocarbons. No. 1,903,500. Calcott, et al E. I. duPont & Co.

Nitrocellulose, urea-formaldehyde condensations and animal oils, for manufacture of artificial masses. No. 1,904,529. Pungs & Eisenmann to I. G. F.

Resinous plastic bodies from heating alkali or alkali polysulphides with oil. No. 1,907,380. J. Baer. (Switzerland).

Presses

Hydraulic molding press with movable cooling platen. No. 1,904,239. Johnson, Hanson & Waters to Western Electric Co.

Urea, Etc.

Molding powder and methods, for producing articles from urea-aldehyde condensation products. No. 1,904,243. M. Landecker, (Germany).

Urea plastic mass with free sulphur liberated upon acidification. No. 1,904,244. M. Landecker, (Germany).

Molding composition of thermosetting urea resin, carried as an impregnum in finely divided cellulose. No. 1,905,999. C. Ellis to E.-F. Co.

Miscellaneous

Preservation of ethyl ether against deterioration. No. 1,903,642. Cox & Greer to Carbide & C. Chem. Co.

Method of softening celluloid with acetone, for the production of articles from it and the like. No. 1,903,530. William Mendel.

For the reduction of furfural acetone and derivatives. No. 1,903,850. F. N. Peters, to Quaker Oats Co.

Resistance panel board, with covering and insulation of all conducting parts. No. 1,904,136. C. E. Hanny to Trumbull Electric Mfg. Co.

Apparatus for production of carbon black. No. 1,904,469. T. F. Keller to General Atlas Carbon Co.

Process for condensation of formaldehyde solutions, for recovery of vapors. No. 1,905,033. H. A. Bond to Roessler and Hasslacher C. Co.

Method for producing esters. No. 1,905,144. Carswell, Stehley and Alozerij, to Monsanto Chemical Co.

Floor covering; Asphalt-felt with flexible coating of mixed high-and low-viscosity nitrocellulose. No. 1,905,827. C. Ellis to Rezyl Corp.

Diaphragm and coil support, with use of Bakelite to obtain a dead beat member. No. 1,906,066. Holst et al (Holland) to R. C. A.

Cellulose sheeted fiber containing cellulose and Bakelite varnish, as artificial leather. No. 1,905,749. G. A. Richter et al, to B. Brown Company, Me.

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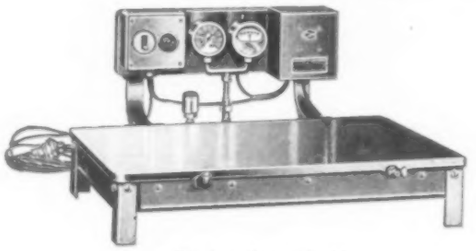

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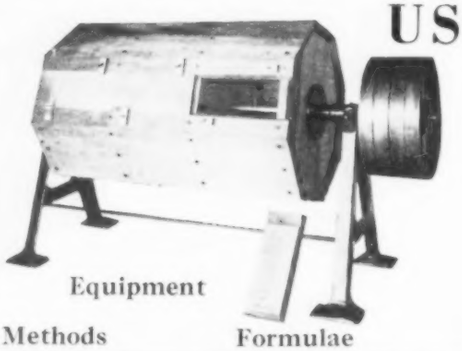

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NEW YORK

And Now, in Closing:—

If you should discover over seven acres of acetate over your head some day, just be nonchalant! It will be the Macon, the Navy's new dirigible. Her fabric is covered with acetate solution.

Having unsuccessfully placed the blame for the Akron disaster everywhere else, they will probably turn to the plastic industry by claiming that the acetate up the fabric.

On the Woman's Page of a recent *New York Evening Post*, Elenore Kellogg objected strongly and logically to the paradoxical uses of Cellophane. Drug Stores selling soggy doughnuts and musty pies, trick the public by dressing them up in appealing transparent paper. We have wondered about this ourselves. Here is a material whose outstanding claim to fame is that it gives quality to the articles wrapped in it. It may be moisture and germ proof, but the public goes for it because it looks, to them, "like a million bucks."

A man sees a shirt in its crinkly transparent wrapper, and he buys it in preference to any other. At home he discovers that the shirt is the cheapest material, poorly made. A woman gets a cake that is similarly packaged, and at dinner time finds it tasteless and indigestible. What sold these products? The wrapping, of course, playing its role of industrial Judas.

The reaction is felt by the legitimate product that deserves to be "Cellophane" wrapped. The virtually indiscriminate sale of the material and its large retail volume has placed it in the hands of public exploiters. It is high time that the producers started a campaign of restriction on the buyer before the public reaction registers on the sales chart.

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And NEWS! Summer or Winter, blow hot blow cold, things keep happening—new products, mergers, suits, meetings and hundreds of daily events. So take heart: Plastic Products will not go on vacation!

People generally have been making wisecracks at the coming Century of Progress (World's Fair to you). Reluctantly, we admit our own guilt in this respect. But we're frank to say that we want to see it, notwithstanding a budget to the contrary. Some of our leading plastic manufacturers will be there—Bakelite, General Electric, Westinghouse—and hundreds of exhibitors who use plastic materials in the products they display. Chiefly, though, we are interested to see any gangster-infected community of nonpaid teachers, indicted utility magnates, bankrupt bankers and tax-delinquent citizenry put on a show costing millions! More proof of the pioneer spirit of our ancestors.

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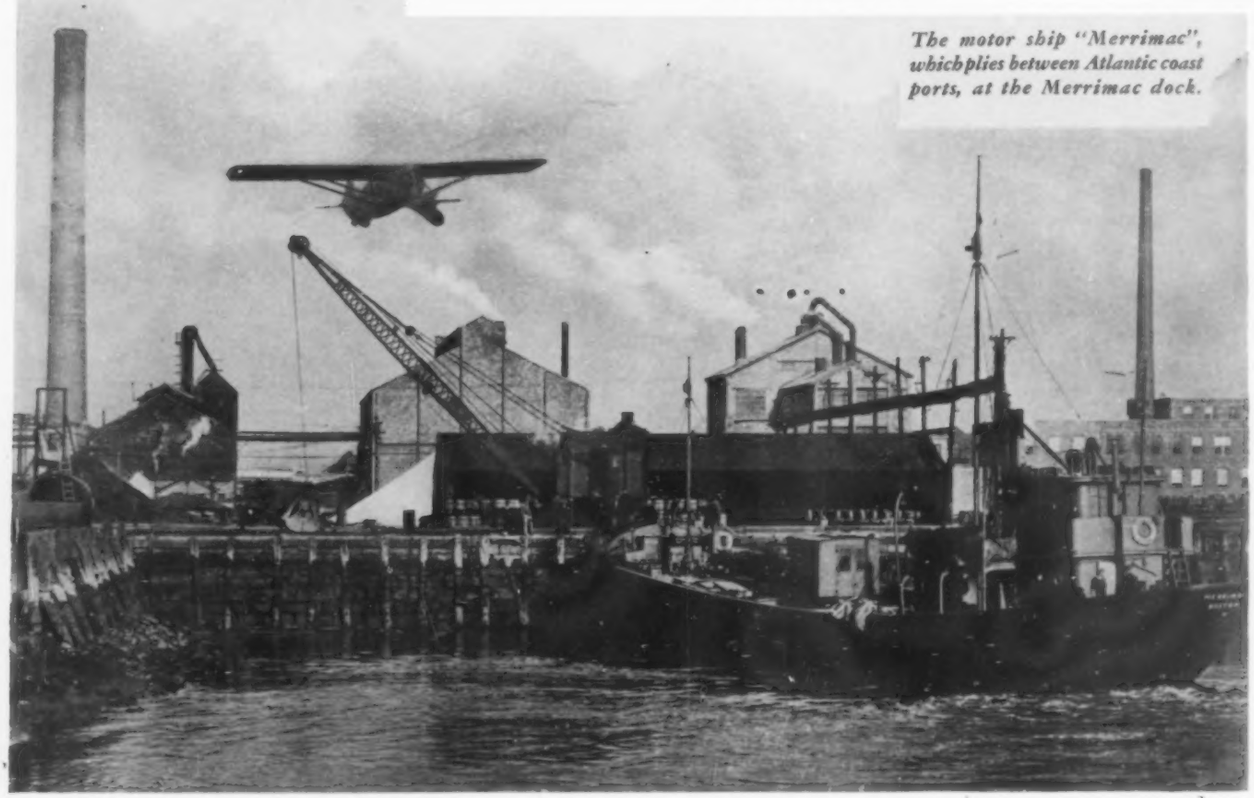

The motor ship "Merrimac", whichplies between Atlantic coast ports, at the Merrimac dock.

Plastic Patents

Abrasives

Abrasive grains in natural resin of plant origin, combined with phenol and hardener. No. 1,907,088. E. E. Novotny to Joseph S. Stokes.

Improved abrasive coating material secured by cellulose-rubber film. No. 1,904,663. H. L. Morris, to Rucel, Ltd., London.

Cellulose

Composite sheet material of fabric with thermoplastic cellulose derivative. Impermeable. No. 1,903,960. Camille Dreyfus.

Process for removing sulfur from cellulose acetate, under super-atmospheric pressure. No. 1,903,961. C. Dreyfus and George Schneider.

The making of cellulose or cellulosic materials by chemical reagents and inert gases or vapors. No. 1,903,962. Henry Dreyfus.

Method of improving cellulose raw material of all kinds. No. 1,904,235. Hottenroth and Faust (Germany).

Method of manufacturing articles from celluloid and the like. No. 1,904,289. Neidich and Mendel.

The manufacture of tapered tubes of celluloid open at both ends. No. 1,904,290. Samuel A. Neidich.

Process and apparatus for the manufacture of cellulose from raw materials. No. 1,904,894. Daniel Westad (Norway).

Cellulosic composition of matter containing a dialkyl hydrophthalate. No. 1,905,516. H. B. Smith to Eastman Kodak Co.

Cellulose ester composition, with a derivative of saturated aliphatic hydrocarbon. No. 1,905,517. H. B. Smith to Eastman Kodak Co.

Composition of organic cellulose and a BB-dialkoxy ethyl carbonate. No. 1,905,518. H. B. Smith to Eastman Kodak Co.

A firm, relatively hard composition, constituting a modifier for cellulose acetate plastics. No. 1,905,535. Walsh & Caprio to Celluloid Corp.

Process for the hydrolysis of cellulose acetate. No. 1,905,536. Webber & Staud to Eastman Kodak Co.

Process for the hydrolysis of cellulose acetate. No. 1,905,537 Webber & Staud to Eastman Kodak Co.

Cellulose thiourethanes and process for making them. No. 1,906,910. Leon Lilienfeld (Vienna.)

Coatings

Shellac substitutes. Combined hydroxy-carboxylic acids with halogen and resinolic acid. No. 1,903,598. Scheiber & Dux (Germany).

Treatment of China-wood oil, under temp. of 625°F. producing liquid ungelled oil. No. 1,903,686. F. M. Reece to O'Brien Varnish Co.

Wood filler; coating composition of polyhydric acids resin, wood filler, cellulose overcoat. No. 1,903,768. P. S. Kennedy to Murphy Varnish Co.

Synthetic resin coating, finished by surface film of nitrocellulose and a synthetic resin of the phthalic anhydride glycerine type. No. 1,904,417. F. M. Crystler, to Jones-Dabney Co.

Nitrocellulose, urea-formaldehyde condensation products and castor oil—for lacquers, films, etc. No. 1,904,528. Pungs & Eisenmann, to I. G. F.

Laminated

Decorative laminated product, with printed design on transparent outer surface. No. 1,904,718. J. D. Cochrane, Jr., to Formica Insulation Co.

Compressed fibrous products, of veneered sheets bound by phenolic condensation product. No. 1,905,225. A. Hawerlander to Halizite Corp.

Improvement in manufacture of laminated glass by burning intersheet to the edge of laminated. No. 1,905,430. E. M. Ball to Libey-Owens-Ford.

Composite glass; cellulose ester plastic sheets with joining layer of soft synthetic resin, etc. No. 1,906,474. M. L. Macht to Duplate Corp.

Apparatus for making composite glass. No. 1,906,821. J. H. Sherts to Duplate Corp.

Phenol, Etc.

Method for phenol-formaldehyde resins, of an alkaline earth metal base. No. 1,903,809. Carleton Ellis to Ellis-Foster Co.

Condensation product from halogenated phenols and aldehydes. No. 1,906,890. Weiler, Wenk, Berres & Stotter, to I. G. F. (Germany).

Plastic Compositions

Sealing composition of water, casein, glue, glycol, titanium oxide, etc. No. 1,904,445. D. M. Gray, to Hazel-Atlas Glass Co.

Resinous emulsion, in process for synthetic rubber-like material from polymerizable hydrocarbons. No. 1,903,500. Calcott, et al E. I. duPont & Co.

Nitrocellulose, urea-formaldehyde condensations and animal oils, for manufacture of artificial masses. No. 1,904,529. Pungs & Eisenmann to I. G. F.

Resinous plastic bodies from heating alkali or alkali polysulphides with oil. No. 1,907,380. J. Baer. (Switzerland).

Presses

Hydraulic molding press with movable cooling platen. No. 1,904,239. Johnson, Hanson & Waters to Western Electric Co.

Urea, Etc.

Molding powder and methods, for producing articles from urea-aldehyde condensation products. No. 1,904,243. M. Landecker, (Germany).

Urea plastic mass with free sulphur liberated upon acidification. No. 1,904,244. M. Landecker, (Germany).

Molding composition of thermosetting urea resin, carried as an impregnum in finely divided cellulose. No. 1,905,999. C. Ellis to E.-F. Co.

Miscellaneous

Preservation of ethyl ether against deterioration. No. 1,903,642. Cox & Greer to Carbide & C. Chem. Co.

Method of softening celluloid with acetone, for the production of articles from it and the like. No. 1,903,530. William Mendel.

For the reduction of furfural acetone and derivatives. No. 1,903,850. F. N. Peters, to Quaker Oats Co.

Resistance panel board, with covering and insulation of all conducting parts. No. 1,904,136. C. E. Hanny to Trumbull Electric Mfg. Co.

Apparatus for production of carbon black. No. 1,904,469. T. F. Keller to General Atlas Carbon Co.

Process for condensation of formaldehyde solutions, for recovery of vapors. No. 1,905,033. H. A. Bond to Roessler and Hasslacher C. Co.

Method for producing esters. No. 1,905,144. Carswell, Stehley and Alozerij, to Monsanto Chemical Co.

Floor covering; Asphalt-felt with flexible coating of mixed high-and low-viscosity nitrocellulose. No. 1,905,827. C. Ellis to Rezyl Corp.

Diaphragm and coil support, with use of Bakelite to obtain a dead beat member. No. 1,906,066. Holst et al (Holland) to R. C. A.

Cellulose sheeted fiber containing cellulose and Bakelite varnish, as artificial leather. No. 1,905,749. G. A. Richter et al, to B. Brown Company, Me.

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Wanted—The following copies of Plastics & Molded Products: January, February, April and June 1926; February and March 1927; January and March 1928; January, March and April 1930; March 1931; March 1932; Reply to Box 606.

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NEW YORK

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